DECEMBER 1959

Precision Metal Molding

INCLUDING DIE CASTINGS MAGAZINE

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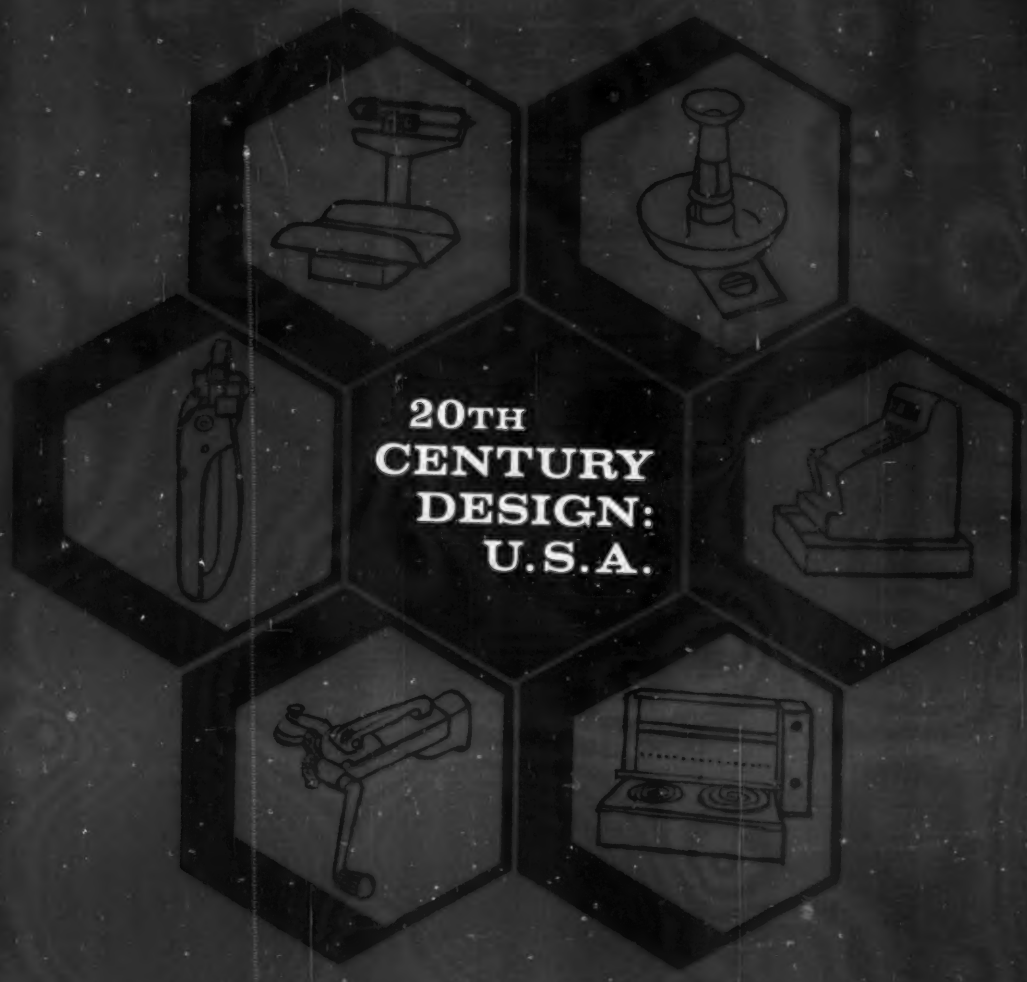

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PMM

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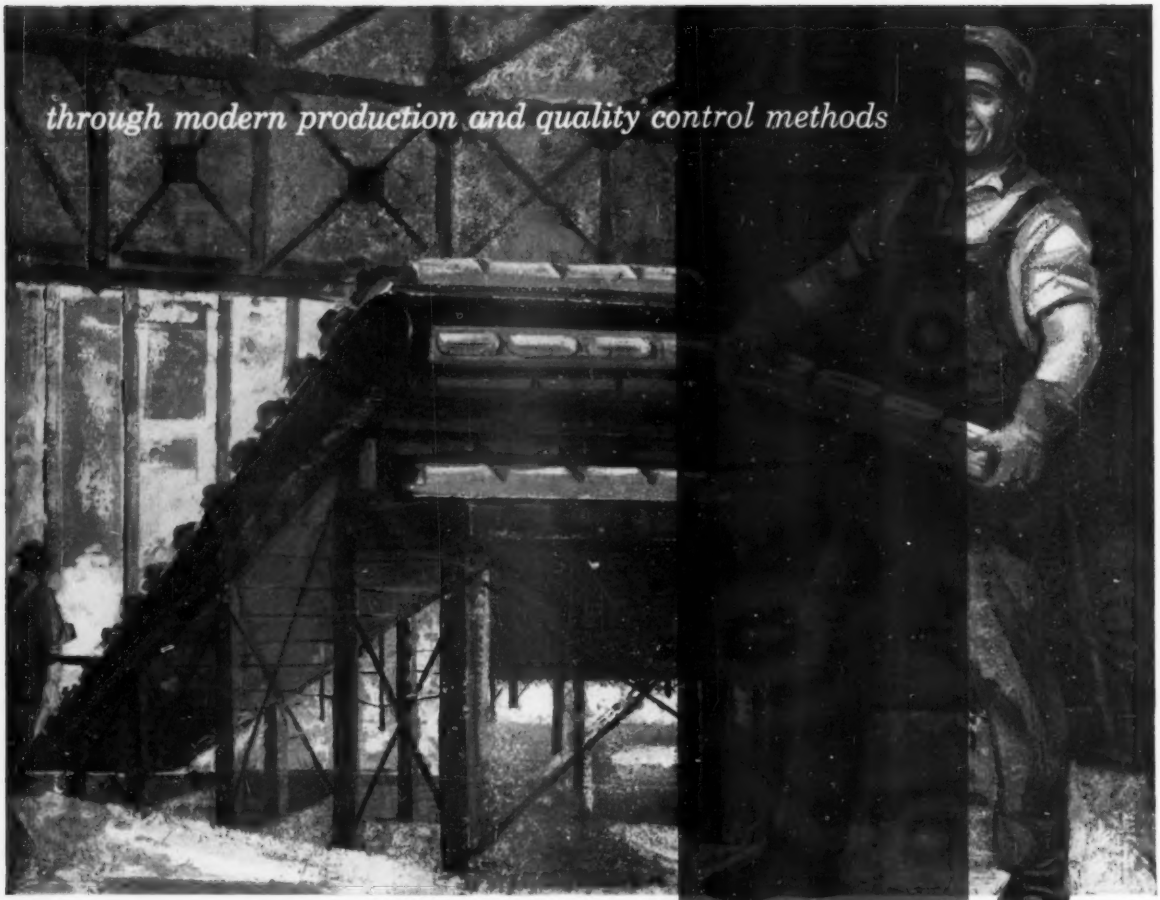

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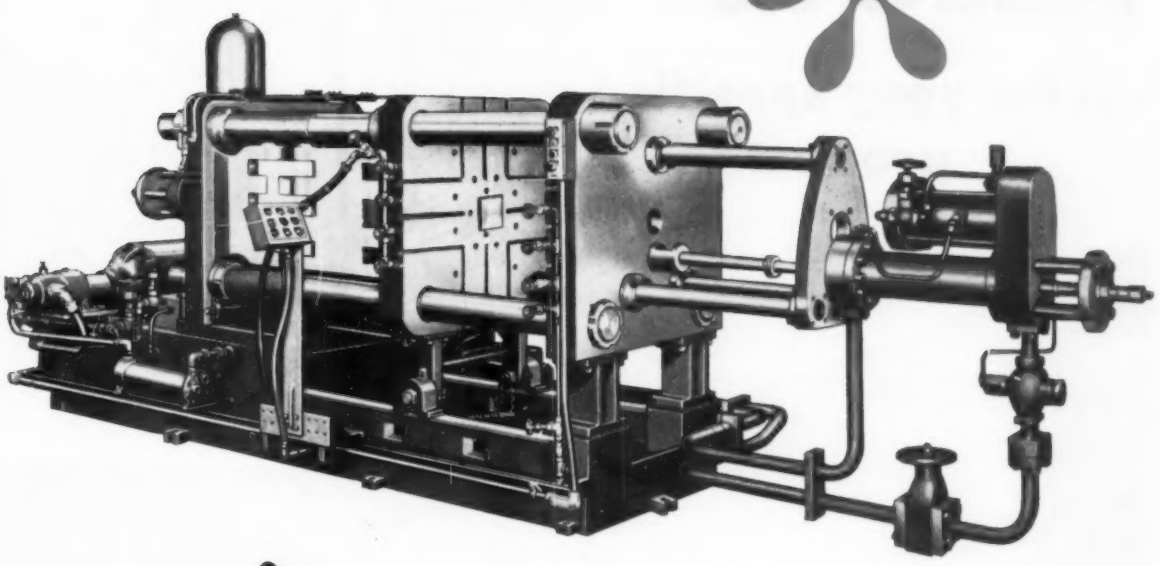

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Tie Bar Diameter		5½
Space Between Tie Bars		23 HOR. 25 VER.
Die Mounting Plates		7x38x40
Die Thickness	Min. Max.	8 36
Die Stroke	Min. Max.	9 15
Locking Pressure (tons)		500
Injection Cyl. Diameter		4⅝
Injection Cyl. Stroke (Adj.)		14 to 19½
Shot Position		on center and 6" below center

(All dimensions in inches)

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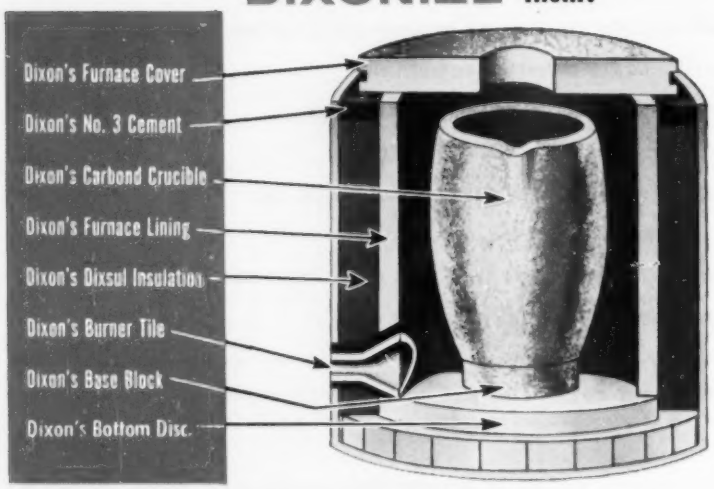

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CASE HISTORIES FROM MT. VERNON FILES

Subject:

Foremost Appliance Corp., BROOKLYN, NEW YORK

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The result is an intricate integral casting that contains, among other details, bearing wells for motor drive shaft and reduction gears, along with bosses to mount the heavy-duty, high-speed motor and gear train. There are no bearing alignment problems, because the casting is extremely strong...able to hold critical tolerances despite its light weight and compactness.

The casting also contains bosses for back-panel mounting, recessed cam actuator channel, switch actuator guide pins, switch mounting guide, slots and perforations for the sliding face plate, front and bottom air vents, and switch-limiting post projecting from the trim, modern face. These rigid, rugged castings are supplied trimmed and machined, with switch slot and mounting holes already punched. 12 secondary assembly operations were thus eliminated from the prototype.

Mt. Vernon's experienced four-fold service helped solve Foremost's challenge in record time...an 11th hour challenge to have their product in stores in time for Christmas selling. First...designing the many cost-saving features into the casting—second, making the extremely intricate, extremely precise dies, with nameplate inserts—third, utilizing their huge, modern die-casting facilities for lower-cost quantity runs of more perfect castings—and fourth, complete machining facilities for on-time delivery of clean castings ready for baked-enamel finishing and assembly.

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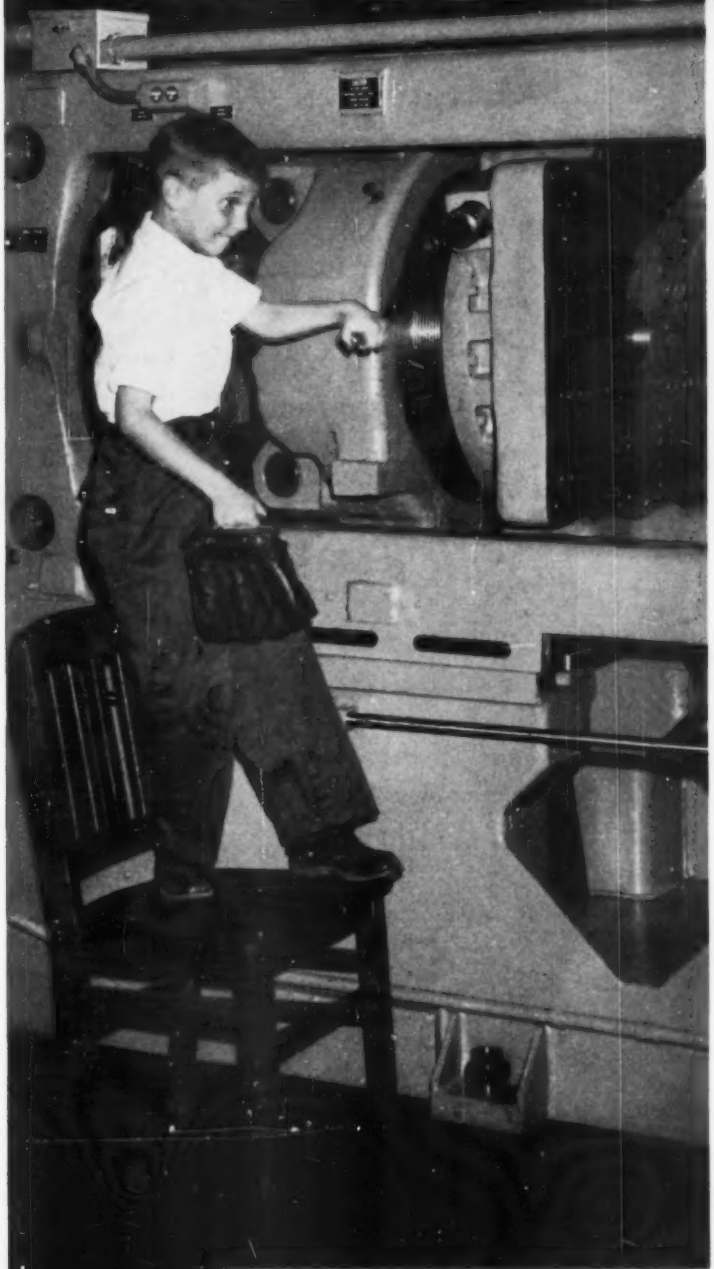
WHAT MAKES A DIE CASTING MACHINE VALUABLE?

THIS BOY IS EIGHT!...



...and he's turning the adjusting screw on a Lester Die Casting Machine. That eight-year-old *strength and skill* is all that's needed to set the die height on a Lester—with no risk to alignment or accuracy. Contrast this with the scene in many die casting shops where a grown man must *sledge* the tie bar nuts to make a comparable adjustment.

What's the difference? Well, it all starts with the Lester cast steel frame, a marvel of rigidity, hand-scraped to an enduring alignment of .001". Mounted in this structure is an extra adjusting platen which is connected to the movable platen by a huge screw.

When the boy turns the crank... a worm turns the screw and the necessary die height is set as the movable platen inches in or out, floating on hardened steel gibs. With an "instrument" like this, any man in your shop can make micrometer-like adjustments as the dies heat up. It's literally child's-play.

What makes one die casting machine more valuable than another? Just such features that take the human element out of the process...features found only on a Lester.

Write today for full specifications on the complete line of Lester machines for either aluminum or zinc.

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CASTING ABOUT

technical news of applications
& processes involving precision metal moldings

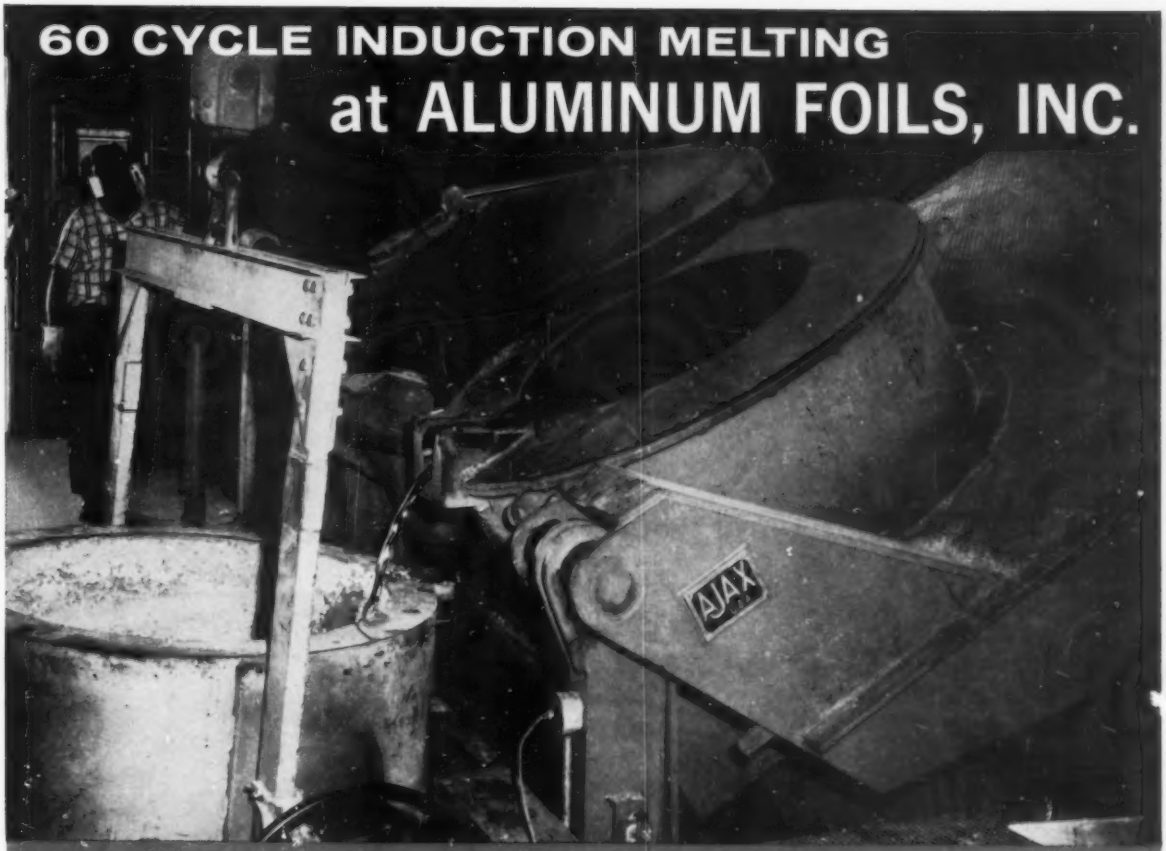
AMERICAN MOTORISTS may get a long deserved break if the development work of Reynolds Metals and Centr-O-Cast & Engineering Co. proves out. In a joint development program, these two companies have come up with an all-aluminum cast muffler. Road tests on the new muffler indicate that a cast aluminum muffler will last as long as the car. The new unit weights only 60% as much as present mufflers and, based on the replacement market alone, there is a potential for 500 million pounds of aluminum in this single application. The big advantage of the cast unit is its excellent heat dissipation characteristics. Under all road testing conditions, the maximum temperature recorded was at least 300°F below any danger temperature (the temperature where active internal corrosion could start). Another big advantage of the design is the ability to cast a shape which would fit into the available space under a car. Some auto manufacturers have to design and build as many as 30 different mufflers for a single line of new cars. Thus, a single cast unit can be used instead of up to six small mufflers linked in different locations to meet underbody clearance requirements. The mufflers are cast in two halves and bolted together. No details of internal structure are available yet, but if these new units are going to compete in the replacement market it is most probable that they will be either die or permanent mold cast when full production gets under way. Up to now, no announcement has been made about corrosion resistant tail pipes, another source of grief and woe to the motorist.

L. W. WICKSON, Centr-O-Cast & Engineering Co. (left) and J. Donald Shircliff, Reynolds Metals Co., compare a cast aluminum muffler (center) with two steel mufflers after identical road testing.

PURE CHROMIUM has a lot of interesting, even exciting, properties in both nuclear and structural applications—if it were ductile. As a structural material, its remarkable resistance to corrosion and oxidation makes it attractive. It could be the perfect skin for high-speed aircraft and missiles and could be the answer to containing the hot exhaust and propulsion gases of rocket nozzles and jet tubes. In nuclear energy work, pure chromium might be the answer to containers for fuel elements. If it were ductile. Now, ductile chromium has been produced by Dr. James Wong of Nuclear Metals, Inc. What's more, the method and equipment used to produce ductile chromium are considered as practical prototypes for production. Dr. Wong took pure chromium metal powder made by Union Carbide Metals Co. and cold compacted it into a mild steel container. The powder compact, in the container, was heated, placed in a 1000 ton press, and extruded over a mandrel. The resulting extruded tubing was highly ductile, nearly perfect in form and closely approached theoretical density. Thus far, tubes 1.0″, 1.2″, and 1.4″ OD have been made with wall thicknesses of 0.06″, 0.07″, and 0.10″.

PURE CHROMIUM tubing is hot extruded from a billet made by compacting chromium powder in a steel container.

60 CYCLE INDUCTION MELTING at ALUMINUM FOILS, INC.



AJAX-JUNKER Coreless 60 Cycle Induction Furnace

Economically Melts Aluminum Foil, Chips, and Sawings.

The 700 kw AJAX-JUNKER coreless induction furnace at the Jackson, Tenn., plant of ALUMINUM FOILS, INC. — specialists in high-quality aluminum foil, coiled sheet, and super-purity aluminum pig — is the largest unit of its type in operation in this country. With a total capacity of 7000 lbs of aluminum, the furnace is capable of melting 3200 lbs per hour.

The AJAX-JUNKER furnace at this company melts plant scrap consisting of foil, scalper chips, and sawings, materials requiring special attention when using conventional furnaces. With the AJAX-JUNKER furnace and its strong inherent stirring action, no labor is required for 'puddling'. One man controls the entire operation.

Average metal losses are below 2% in this installation where experience with other furnace types showed average losses of over 6%. Accurate temperature control, dependability, and uniformity of alloy composition are further features of this unit. ALUMINUM FOILS are also producing hardener alloys directly from plant scrap with a minimum of effort and a maximum of alloy accuracy.

The AJAX-JUNKER 60 cycle induction furnace is an ideal tool for many different applications, melting ferrous and nonferrous metals. Our engineers will be glad to study your melting requirements. Write to AJAX ENGINEERING DIVISION, Trenton 7, N. J., for Bulletin R 58.

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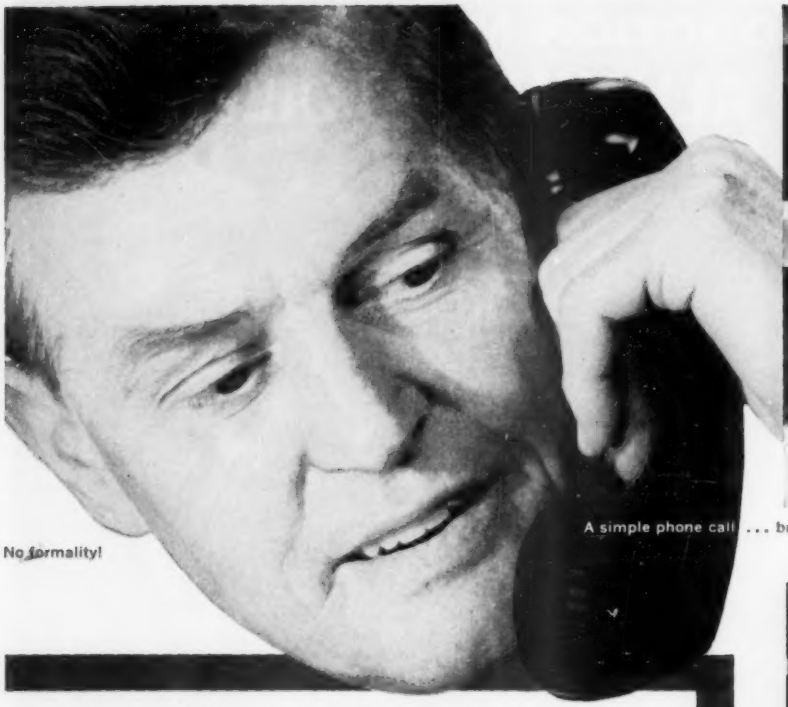

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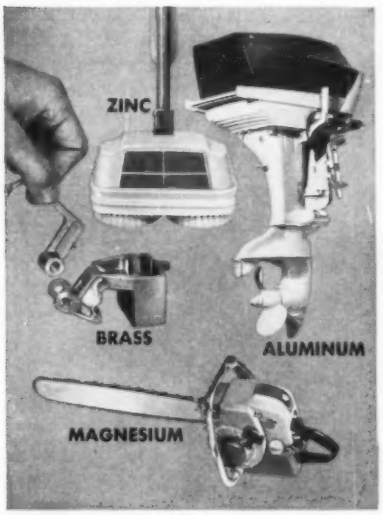
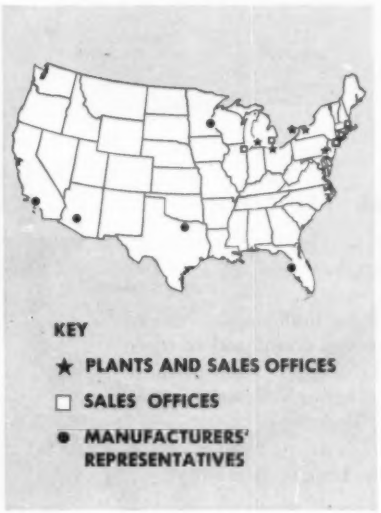
. . . and evaluating the economics of die casting . . .

. . . plating or otherwise finishing . . .



using the most appropriate die casting alloys.



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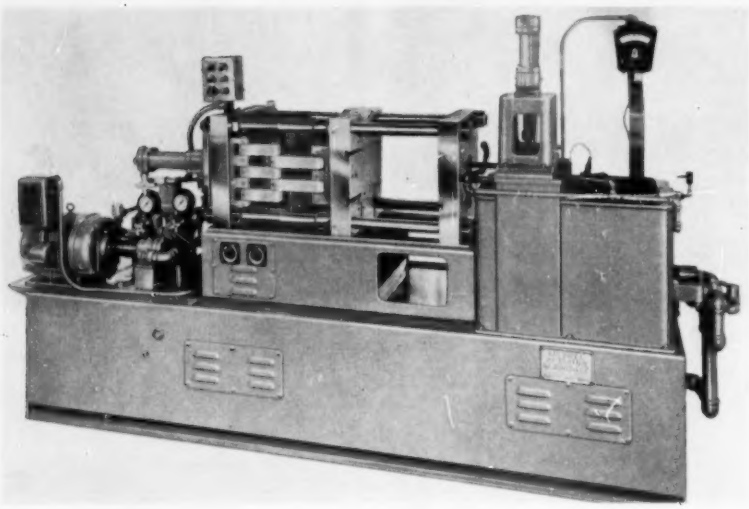
NEW PRODUCTS AND DEVELOPMENTS

Qualified readers can get complete details on these products. Use the Reader Service Cards. You'll find them facing page 76 of this issue



500 SHOTS PER HOUR

AMERICAN DIE CASTING MACHINERY CO. has anounced a number of major improvements in the Model 150Z Hot Chamber Die Casting Machine.

Now included as standard equipment is a 950 lb. melting pot and a new gooseneck design that is said to add many years of service. The Safety-Shot-Die-Interlock has been redesigned for 100% safety to operators against molten metal dangers.

The 150Z has a 4 lb. shot capacity and up to 500 shots per hour. Die platens measure 20" x 21". Solid steel toggle links are an exclusive on this make machine.

Circle No. 235 on Reader Service Card

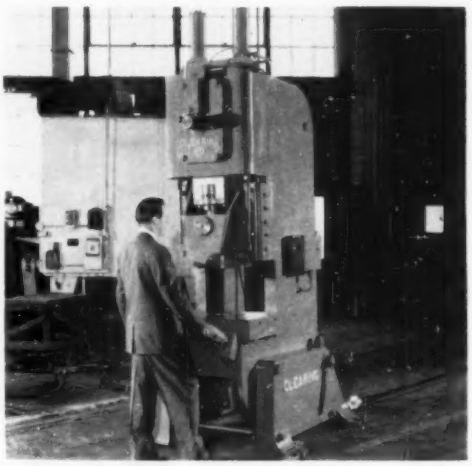
60-TON PRESS BUILT ON "MODULAR" PRINCIPLE

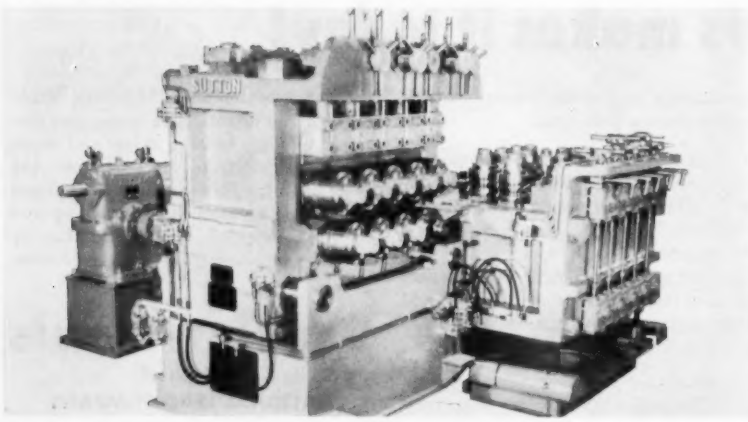
CLEARING DIV. OF U.S. INDUSTRIES, INC. — This 60 ton capacity machine has been added to the company's line of Torc-Pac O.B.I. presses.

The press is the first standard press to be built on the "modular" principal. This means that each press is composed of three basic units — the frame, the drive, and the head. Each of these units are completely interchangeable. This solves many problems of maintenance and obsolescence.

The press, like others in the line, features an air-friction clutch which uses bronze friction plates. The bronze friction plates operate in a sealed-in-oil enclosure. The oil, in addition to lubricating and dissipating heat, absorbs the shock of the "pickup" load during engagement.

Circle No. 236 on Reader Service Card





HIGH-SPEED STRAIGHTENING

SUTTON ENGINEERING CO. — The Sutton 2L Straightener is a new two-plane unit designed for high-speed straightening of steel and non-ferrous flats and shapes.

In one installation the unit is accurately straightening ⅜" to 1¾" aluminum alloy hexagons and squares at speeds to 300 f.p.m. Larger versions of the 2L Straightener will handle ½" to 2½" square and hexagon cold-drawn steel bars.

Circle No. 237 on Reader Service Card

continued on page 60

You get
speedier service
from the
ZINC ZONE

Central location of
American Zinc plants assures
prompt deliveries of slab zinc to
any point in the nation.

HILLSBORO, ILL., PLANT
Prime Western, Brass Special, Intermediate, High Grade, Continuous Galvanizing Grades
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Special High Grade, High Grade, Continuous Galvanizing Grades, Special Shapes
FORT SMITH, ARK., SMELTER
Prime Western, Brass Special
DUMAS, TEXAS, SMELTER
Prime Western, Brass Special, Continuous Galvanizing Grades

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Circle No. 6 on Reader Service Card

HEVI-DUTY ovens with "Unitized Control System"

"UNITIZED CONTROL SYSTEM" PACKAGE *designed for automatic operation. One push button on the operator's control panel starts operation sequence, determined by process requirements. At center, component control cabinet, mounted outside of oven, features swing-out panel for easy maintenance of system.*

...factory PREWIRED and TESTED for cost-saving installation

● *"Unitized Control System" reduces and simplifies job-site wiring of instrumentation of ovens used in foundry core-baking and heat treating.*

Designed and built into a compact package, the "Unitized Control System" is a systematic arrangement of electrical controls, neatly wired to a terminal board for simple and easy connection to oven-mounted components. Because all electrical components are prewired and tested at the factory, Hevi-Duty assures reliability of control for continuous oven operation. A schematic wiring diagram, furnished with each control system, clearly shows each terminal of all controls. This, too, helps minimize installation and maintenance costs.

With "Unitized Control," you can be sure of a precise control system flexible in design . . . easy to maintain . . . neat in appearance.

A typical "Unitized Control System" for ovens consists of: cover interlock disconnect, when required by code; fuse for each phase of heater, motor and control circuits; thermal-overload protected starter for each motor, with thermal-overloads connected in series to coil of control relay; purge timer for all control systems involving combustible products or fuels; a flame-fail relay for each fuel-fired burner; sequence relays and timers for all processes involving automatic sequence of operations, and control transformer.

"Unitized Control System" is standard on all Hevi-Duty industrial ovens. For more information contact Hevi-Duty.

HEVI-DUTY

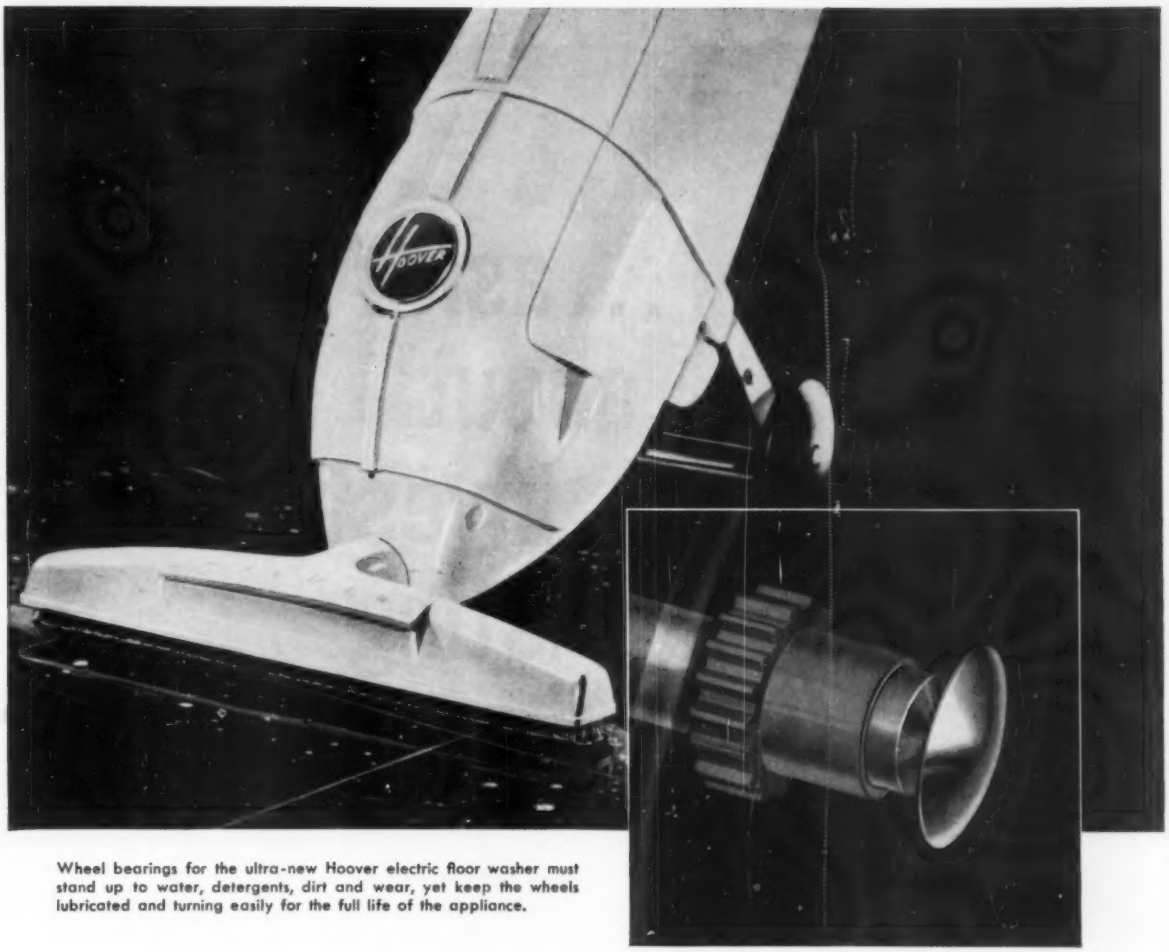
BULLETIN! *For information on continuous and batch type Hevi-Duty ovens, write for Bulletin 159.*

A DIVISION OF BPC BASIC PRODUCTS CORPORATION

HEVI-DUTY ELECTRIC COMPANY, MILWAUKEE 1, WISCONSIN

Industrial Furnaces and Ovens, Electric and Fuel • Laboratory Furnaces • Dry Type Transformers • Constant Current Regulators

Circle No. 24 on Reader Service Card



Wheel bearings for the ultra-new Hoover electric floor washer must stand up to water, detergents, dirt and wear, yet keep the wheels lubricated and turning easily for the full life of the appliance.

GLIDDEN POWDERED METALS KEEP THE WHEELS TURNING

Among the many unique problems faced by The Hoover Company in designing the world's first electric floor washer and dryer for home use, was the important matter of wheel bearings.

These bearings had to endure moisture, dust, grit and detergents, yet provide a close-tolerance, self-lubricating surface for upwards of ten years' hard use.

Hoover engineers with the aid of Carbon City Products Company, powdered metal parts producers, came up with the answer—oil-impregnated sintered bronze bearings made with Glidden Resistox powdered metal.

Perhaps you, too, have a demanding problem for which sinterings can provide the solution.

As a leading supplier of metal powders, Glidden works closely with parts producers. This places several staffs of experienced engineers at your service, providing complete technical service.

We welcome your inquiries.

QUALITY Glidden PRODUCTS

RESISTOX METAL POWDERS

The Glidden Company
Chemicals—Pigments—Metals Division
Hammond, Indiana

COPPER POWDER • LEAD POWDER • TIN POWDER • BRASS POWDER • ALLOY POWDER • FILTER POWDER
CUPRIC OXIDE • CUPROUS OXIDE • CUPROUS SULFIDE • CUBOND COPPER BRAZING PASTE • COPPER PIGMENT

Circle No. 21 on Reader Service Card

Is your new design complex?

...ask Arwood about investment casting

When you can't simplify the part any more without sacrificing function...

When the production people tell you it will be too costly to machine...

When you think you could cut production costs by making several parts as a single piece...

When function calls for a tricky shape but the intended service makes you specify, a hard, strong, tough-to-work alloy...

When any or all of these design problems are keeping you awake nights... then is the time to consider making the part an Arwood precision investment casting.

Here's why...

Investment casting by Arwood lets you stop worrying about *how to make* the part. You can design for function and end use... Arwood will give you the shape you need, in the quantities you need, from a few hundred to many thousands. Arwood casts all the ferrous and non-ferrous metals and alloys, from aluminum and magnesium right through to stainless steel and cobalt- and nickel-base superalloys.

Write today for your free copy of the new 44-page Arwood "Practical Guide to Investment Casting". It provides all the information you need to evaluate the technique and use it to help solve your design problems.

MACHINE THE SIMPLE...CAST THE COMPLEX

arwood

ARWOOD PRECISION CASTING CORP., 323 W. 44th St., N. Y. 36, N. Y.

A complete service from design through tooling, production and finish machining. Sixty-two engineering consultants from coast to coast.

PLANTS IN BROOKLYN, N. Y.; TILTON, N. H.; GROTON, CONN. & LOS ANGELES, CALIF.

Circle No. 8 on Reader Service Card

A completely self-contained high-frequency induction heating and melting unit that can be installed in 2 hours

Ideal for Air or Vacuum Melting, Sintering and Hot Pressing

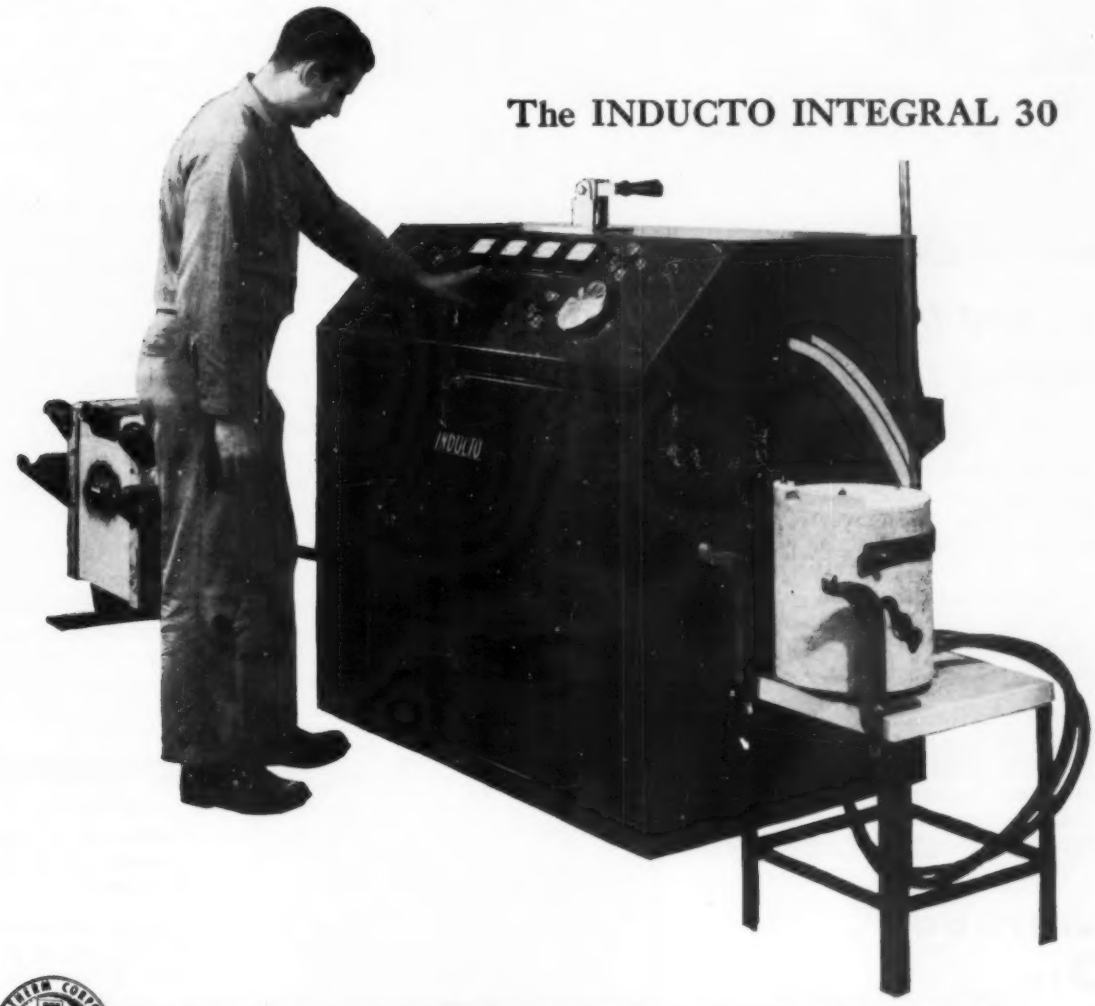
The Inducto Integral 30 is an efficient and economical melting unit that can be easily adapted to a variety of applications. Its console control panel contains all the equipment necessary to operate high-frequency induction furnaces and coils—a motor-generator set, capacitors, transformer and complete controls. Over 20 capacitor and 8 transformer steps, easily controlled from the front, provide the necessary flexibility to assure matching full power to all load conditions throughout the heating or melting cycles. The entire unit is designed for maximum dependability and ease of operation.

The Integral 30 is installed simply by connecting it to a 220 or 440 volt power supply, a cold water line and a drain. In fact, it is so compact and easy to install anywhere, the console can be made portable just by mounting it on casters.

Unique water-cooled leads simultaneously supply power and water to the furnaces. The same leads, with slight modifications, provide an economical power entry system for vacuum melting applications.

The Integral 30, with all the advantages of induction melting and Inducto engineering features, is truly the outstanding melting unit in the 5 to 100 pound range. No other equipment can offer you the same versatility, efficiency and economy. For complete details, write for Descriptive Bulletin 20-30, Inductotherm Corp., 412 Illinois Ave., Delanco, N. J.

The INDUCTO INTEGRAL 30

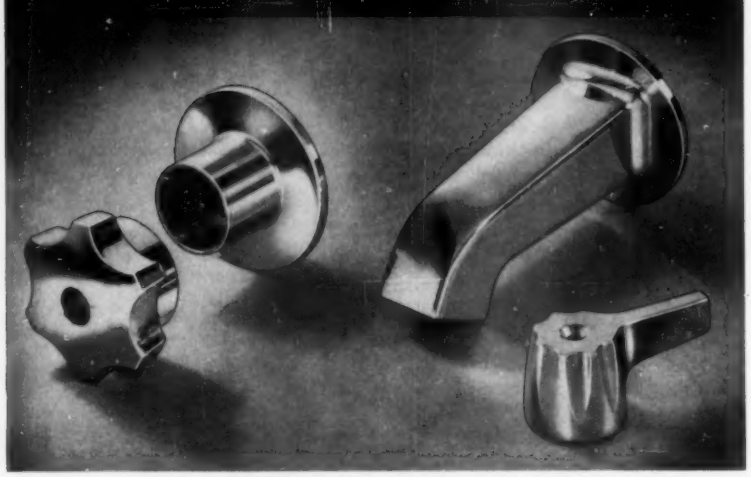


INDUCTOTHERM

INDUCTO ... the mark of modern melting

Circle No. 28 on Reader Service Card

QUALITY is a FIXTURE at L.D.C.



. . . and these fine finish plumbing fixtures tell you why

Quality is fashioned by craftsmanship. Take these sparkling chrome plated zinc castings. Note their modern, graceful lines and soft, smooth finish . . . made possible only by the qualities of purity and surface soundness and uniformity of the alloy; and the rigid maintenance of close tolerances by controlled production methods and equipment.

And here is something else! The serrations for the mating spline in the handles of these fine fixtures are held to close dimensional tolerances by reason of the identical same qualities that govern the economical production of these castings.

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Latrobe Die Casting Co.
Latrobe, Pennsylvania

Established 1918

Circle No. 32 on Reader Service Card

PMM LETTERS

the readers' forum

GROWTH

Currently, we manufacture nonferrous castings. However, some of our very fine accounts use a considerable number of small aluminum die castings.

Could you send us literature, prices, etc., about die casting machines? We would like to explore the possibility of entering the die casting field in a very nominal way. In your opinion is this practical thinking? – E. J. H.

Not being gifted with second sight, we can't advise this company about entering the die casting field. While none of the existing custom die casters are starving, they can all use more business rather than less. However, we've sent this reader a list of manufacturers of die casting machines. From here on it's up to him.

UNDERGROUND CORROSION

Will Zamak die cast fittings resist moisture and other elements when buried underground? – L. S., Pres.

Without some sort of surface treatment, it is doubtful if zinc base die castings should be used underground. This inquiry has been referred to companies who specialize in protective coatings for zinc die castings.

VACUUM DIE CASTINGS

The October, 1959 issue contains a request for a list of vacuum die casters in the Midwest area. We are vitally interested in this process, particularly in the region of aircraft components, utilizing aluminum and magnesium alloys.

Can you send us the names of die casting concerns who use this process as well as information regarding the development of the vacuum casting process? – E. J. C., Quality Control Engineer.

A list of die casting companies known to have vacuum casting facilities has been sent. We have also given this reader such information as we have on the process. Several new reports on vacuum die casting are in our files and will be published over the next few months.

HS6460
HIGH STRENGTH ALLOY POWDER...

permits production of higher strength parts at less cost on your present equipment

HS6460 is ideally suited for use in all major applications of ferrous powder metallurgy. It makes possible higher tensile strengths than ever before achieved with ferrous powders on existing production equipment. Excellent carbon compatibility enhances the powder's ability to be heat treated.

HS6460 can be used for comparable strength structural parts at lower manufacturing costs than obtainable with copper infiltration. Additional manufacturing economies can be obtained because fewer operations are required to obtain high density, higher strength parts. Larger parts can be fabricated on normal pressing equipment because of HS6460's excellent compressibility.

For technical data on HS6460 High Strength Powder, including additional test evaluations, write Republic Steel, Dept. PM-8607, 1441 Republic Building, Cleveland 1, Ohio.

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REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

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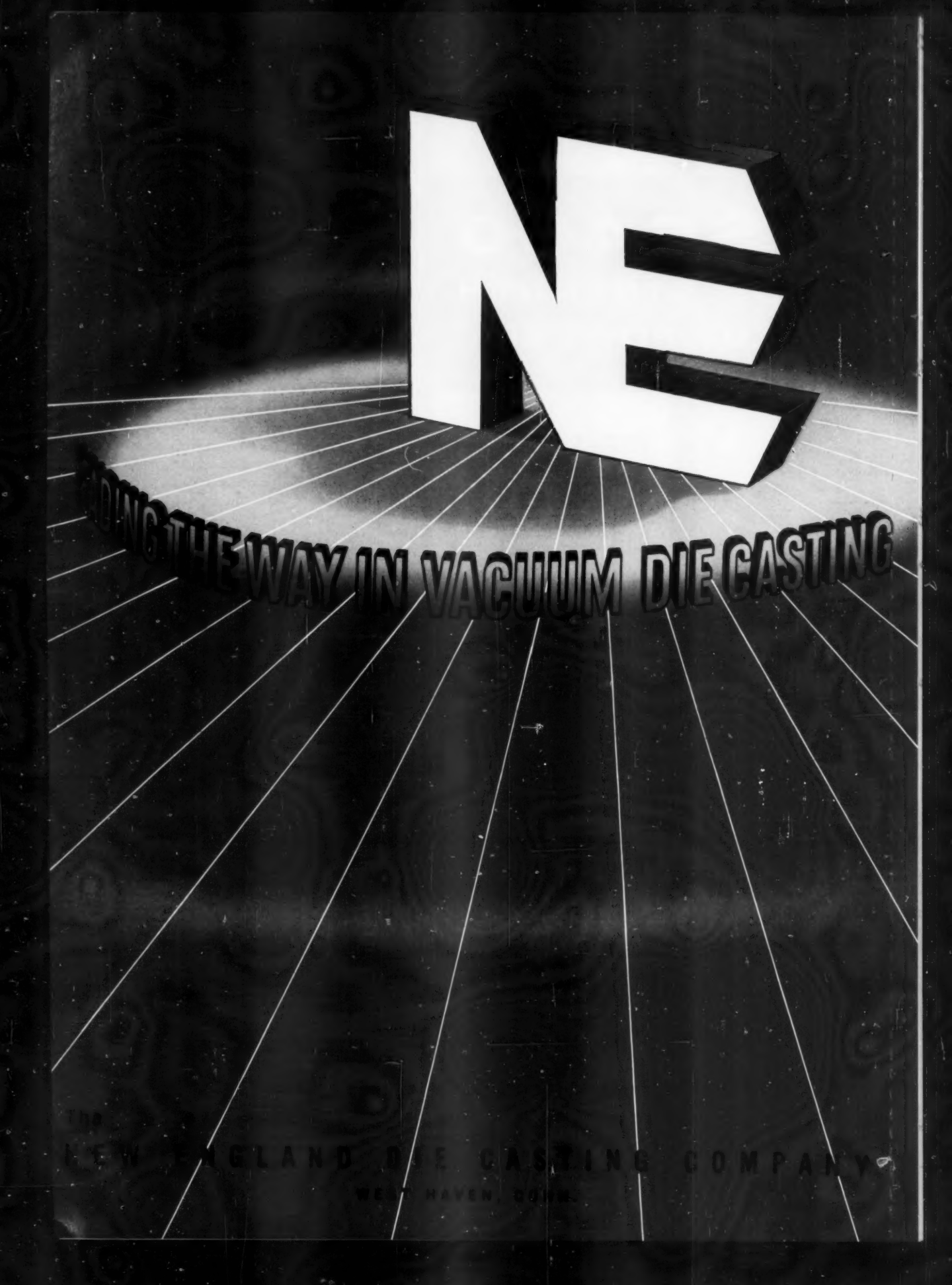

NE
LEADING THE WAY IN VACUUM DIE CASTING
THE
NEW ENGLAND DIE CASTING COMPANY
WEST HAVEN, CONN.

20th Century Design: U. S. A.

INDUSTRIAL DESIGN is one of the newer professions.

The industrial designer has come into his own through the search for better ways to attain mass market acceptance by appearance, price, and performance.

At first, he was an occasional consultant only—called on to "give the looks an arty lift." Today he's an integral part of product planning. Industry looks to him to coordinate diverse considerations to meet demands of the market vs. manufacturing and shop facts. Tolerances, accuracy, and latitude need his analysis no less than desired stability for ultimate use and the kinds of finishes.

All these must balance with cost and market appeal. Usually, market appeal and appearance are interpreted to mean visual effect only. However, the more subtle tactile quality—the "feel of handling"—is often more important and more difficult to achieve. Thus, the industrial designer must combine aptitudes from the arts, economics, psychology, engineering, and the shop.

The role of industrial design is shown effectively in an exhibition, "20th Century Design: U.S.A." This exhibit, co-sponsored by eight museums, suggested this issue of Precision Metal Molding because of the great number of products using parts made by PMM processes.

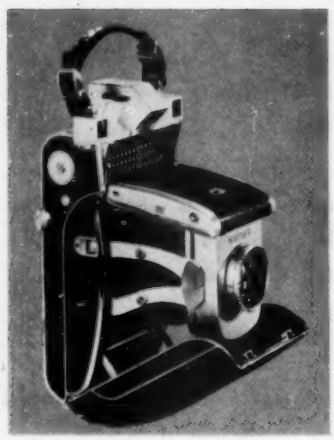
In the following pages we've selected just a few of the many examples which illustrate how industrial designers are becoming increasingly dependent on the PMM processes to achieve smart looks and utility—at low cost.

Alaric Mausser
Art Director

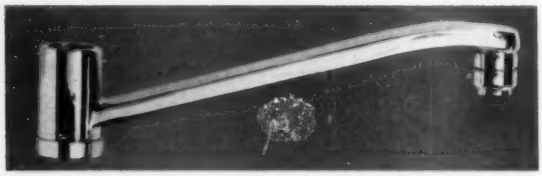
20TH CENTURY DESIGN: U.S.A.

CAMERA BY EASTMAN KODAK CO.
. . . uses die castings

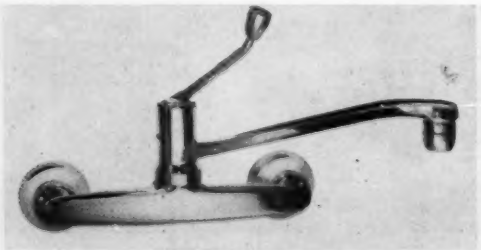
Walter Dorwin Teague



EASTMAN KODAK CO.'s Super Kodak was the first camera with a built-in light meter to automatically control the diaphragm opening. Its die cast case gives it a smart, streamlined look, as well as strength and durability. The design was created by Walter Dorwin Teague. Collaborating with him was Joe Mahalyi of Eastman Kodak, who developed the complex engineering mechanisms required by Teague's basic concept. Teague is the founder and managing director of Walter Dorwin Teague Associates, the oldest organization practicing industrial design. He is the author of several books and many magazine articles. Outstanding are his "Design This Day, the Technique of Order in the Machine Age" and "Land of Plenty." Teague is a Fellow and first president of the American Society of Industerial Designers.



MIXING FAUCET BY MOEN FAUCET DIV.
. . . uses extrusion, sintering, shell molding



A ONE-HANDLE MIXING FAUCET adds the finishing touch to today's modern kitchen. The one shown here is not only of truly modern design, it also is produced by modern manufacturing methods. To combine function, appearance, and economy, three of its parts utilize PMM processes: the spout is an extrusion, the horseshoe-type spacer is a sintering, and the brass faucet body is a shell molding. Moen Faucet Division of Standard Screw Co., manufacturer of the faucet, says, "Years of engineering, testing, and field experience have proved these methods of fabrication to make the best contribution to our goal, which is to give America its quality faucet at an economical price."

THE MODERN HOUSEWIFE no longer has to have her kitchen counter crowded with separate bulky and heavy appliances and a tangle of electric cords. The NuTone In-Built Mixer, produced by NuTone, Inc., is installed in the counter top and, when none of the attachments are in use, the counter is smooth and clear. A number of parts in the mixer are die cast, which proved to be the most practical and economical way they could be made. The mixer was designed by C. E. Waltman, of Waltman Associates. Waltman, during his high school days, worked after school and on Saturdays in the design and decorating department of Berkey and Gay and the Imperial Furniture Co. of Grand Rapids, Mich. In 1916, he moved to Chicago and worked for John A. Colby in their interior and furniture design departments. After serving in the Air Force in World War I, he became a designer for Valentine Seaver, and then for Kaplan and Almco Lamps.

IN-BUILT MIXER BY NUTONE, INC.
. . . uses die castings

C. E. Waltman

THIS PORTABLE FOOD MIXER is another appliance that fits into the decor of today's modern kitchen. It's another example of how functional industrial design can be combined with eye appeal. And, like so many such appliances do, it contains a number of parts made by a modern manufacturing process — die casting. The manufacturer is West Bend Aluminum Co., which points out that these die cast parts are best suited for their purpose — at the lowest cost. Supplier of the die castings used in the mixer is Electric Autolite Co.

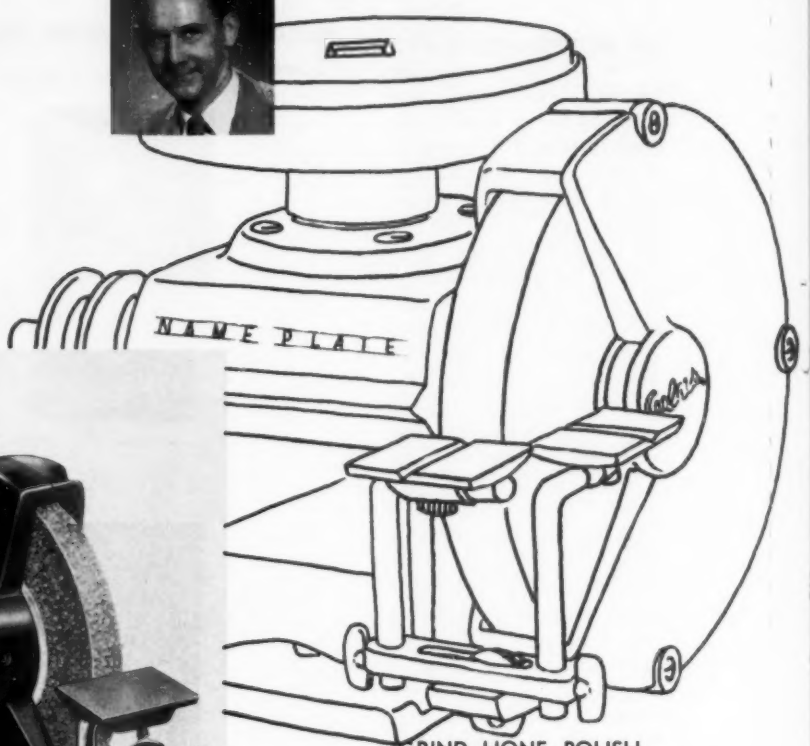
PORTABLE FOOD MIXER BY WEST BEND ALUMINUM CO.
. . . uses die castings

20TH CENTURY DESIGN: U.S.A.

Courtney A. Leubner

GRINDER-HONE BY ATLAS PRESS CO.

. . . uses die castings, sinterings



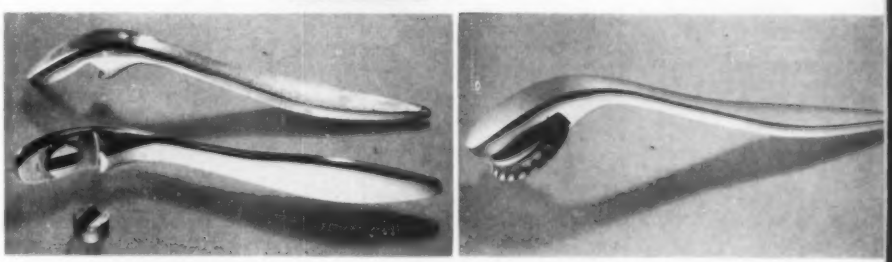
GRIND, HONE, POLISH — these are the operations which can be done on the Atlas Grinder-Hone. And it's probably one of the most abused power tools in the home workshop. Courtney A. Leubner, a graduate mechanical engineer and industrial designer, knew this when he did the initial design work for Palma-Knapp Associates. No one would ever give the bushings a drop of oil, so he put in sintered bushings which carry their own oil supply. Corrosive environment where wear and abrasion are heavy would soon wreck steel parts, except stainless steel. But stainless was much too expensive, so Leubner used die castings. Even in shop equipment, appearance is important. You have to stop the casual shopper and make him want the tool as soon as he sees it. All other factors are considered afterward. There's another advantage of die cast parts: at moderate cost, you get the best possible eye appeal.

TODAY'S HOMEMAKER demands good styling in her kitchen appliances to complement the interior design of her modern home. What's more, she wants this syling at an economical price. Chambers Manufacturing Co. has achieved this dual goal in its console range by taking advantage of three PMM processes. The Thermowell lid handle is an extrusion; sizzle platter and top grate are permanent mold castings; dial hub and dial are die castings. The suppliers of these parts are: Home Plating Co., Fox Co., Reliable Castings Co., and Bohn Aluminum and Brass Co.

CONSOLE RANGE BY CHAMBERS MFG. CO.
. . . uses extrusions, permanent mold and die castings

BEAUTIFULLY BALANCED and streamlined, this smoothly-curved bottle opener made by Hammond ResearchCorp. combines grace with utility. Called the Magnetop, it has a magnet which holds the bottle cap and prevents it from falling after the bottle is opened. The opener is a brass die casting, produced by Hampden Brass and Aluminum Co. It's heavily chromium plated for glistening finish and long wear by Champion Chrome Plating Co. Inventor of the opener is John Hays Hammond Jr., president of Hammond Research Corp. He recently received an Elliott Cresson Medal from The Franklin Institute in consideration of his many inventions and developments in the fields of radio and electronics, particularly for his pioneering contributions and leadership in the invention, design, and development of remote radio control for vehicles moving on or under water. Hammond holds 437 patents.

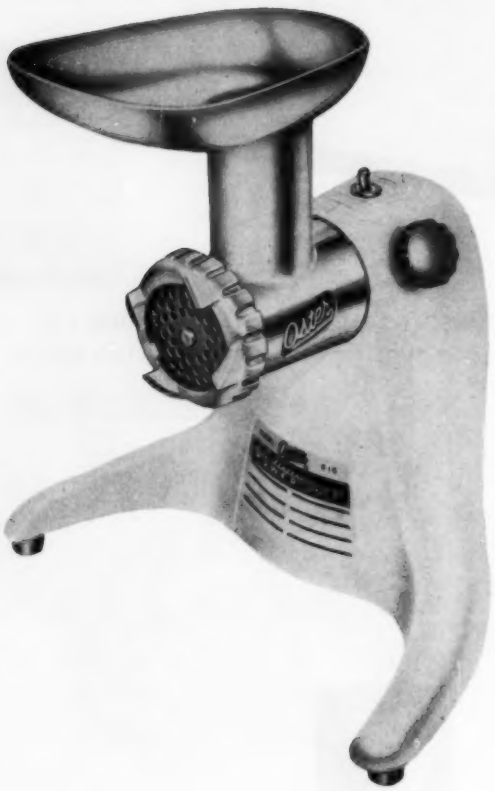
John Hays Hammond, Jr.



MAGNETIC BOTTLE OPENER BY HAMMOND RESEARCH CORP.
. . . uses die casting

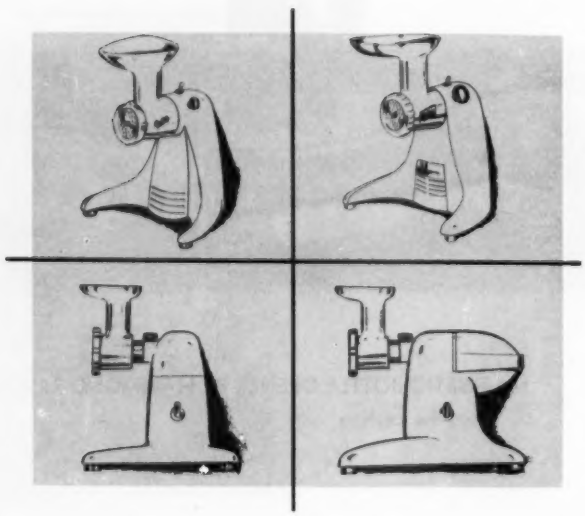
20TH CENTURY DESIGN: U.S.A.

ALFRED W. MADL is the creator of the meat grinder design shown here. He's been an industrial designer for the John Oster Mfg. Co. for the past seven years.



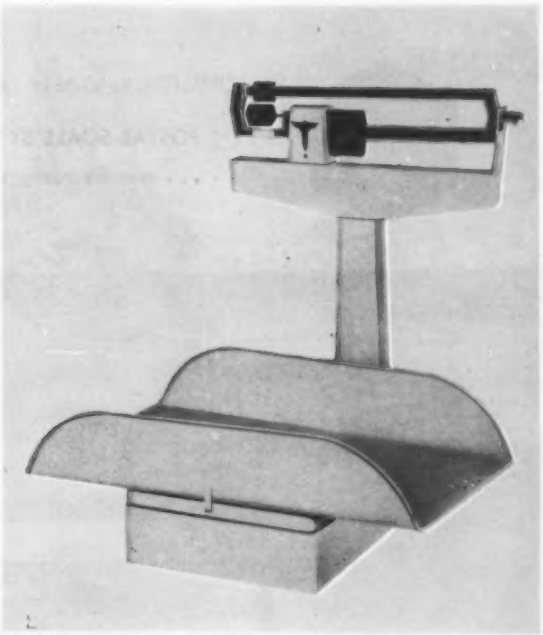
MEAT GRINDER BY JOHN OSTER MFG. CO.

. . . uses die castings



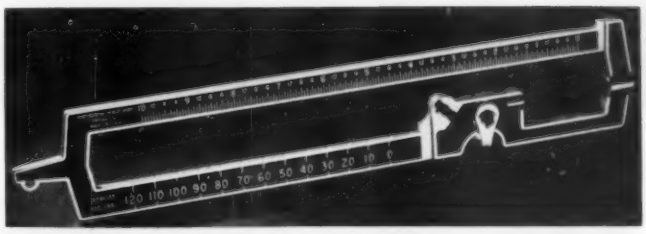
IF A MEAT GRINDER is to sell in today's market, it must do more than simply grind meat. Competition is so keen that styling and eye appeal become essential ingredients in sales. But coupled with eye appeal must be functional worth. To secure both of these requirements, Alfred Madl specified zinc and aluminum die castings. Progression of design is clearly evident in the four sketches shown. A smooth line flow which gives an appliance of good appearance, and, more importantly, an easily-cleaned device has been achieved through the use of both zinc and aluminum die castings. The main frame member which houses the motor and the reduction gears is a zinc die casting. The food hopper and feed screw and the front clamp ring are all aluminum die castings. Thus, corrosion on parts which contact the food is eliminated, and the housing may be enameled or plated to give a durable, easily-cleaned unit. Madl typifies his approach to design problems with this remark: "Working in close proximity with engineering, production, and management has provided a comprehensive flexibility to my design, enabling me to cover the mechanical as well as the aesthetic aspects."

CLINIC SCALE BY CONTINENTAL SCALE CORP.
. . . uses die castings



Jean Otis Reinecke

STYLING of this clinic scale was developed by Reinecke and Associates, under the direction of Jean Ottis Reinecke. The scale represents a careful combination of functional requirements as specified by Continental Scale Corp.'s engineers and of styling objectives expressed by the consultant's designers. The beam, for example, was specifically designed for die casting. The easy-to-read graduations and numerals are die cast integrally with the beam. Functionally, the die casting process imparts strength and dimensional stability to the beam, and enables it to withstand constant sliding of the poises without undue wear. The beam is die cast by Chicago White Metal Casting Co.



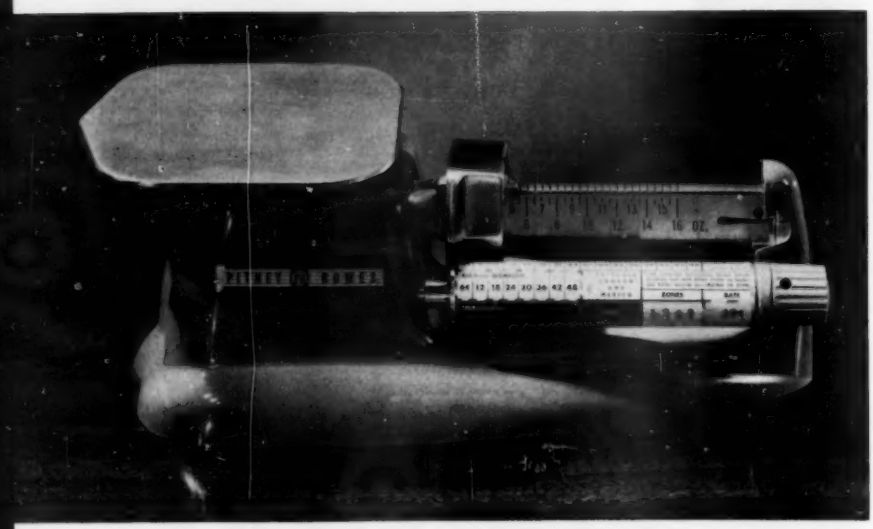
PORTABLE CALCULATOR BY MONROE CALCULATING MACHINE CO.
. . . uses die castings

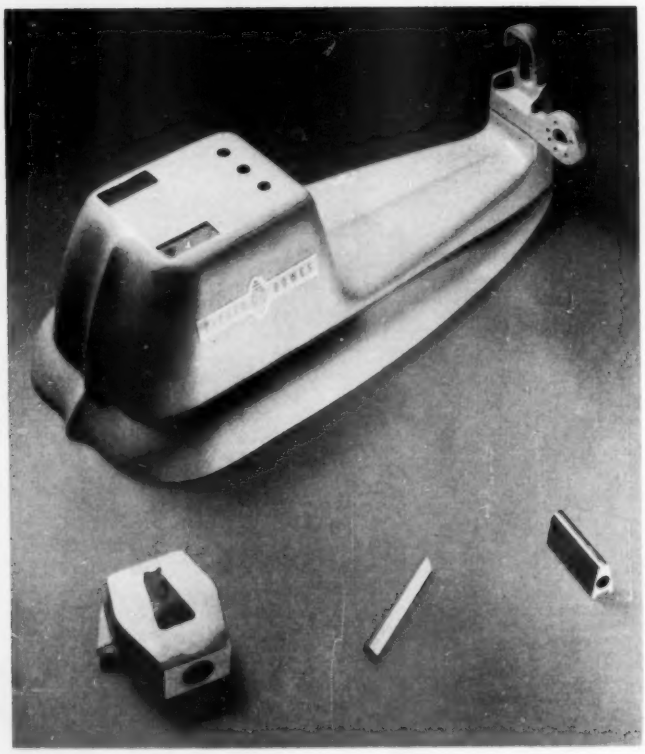
THE PORTABLE CALCULATOR shown here is one of the machines for calculating, adding, accounting, and data processing made by Monroe Calculating Machine Co. The design was conceived by Raymond Spilman, who recently designed the United States Pavilion at the Pacific International Trade Fair in Lima, Peru. Seven of the parts in the calculator are die castings, and they typify the complex shapes and desirable finishes that could not be volume-produced economically by any other method. The die cast parts, which are shown separately, include the case, shift lever, drive crank, folding legs, carriage crank, and two carriage end caps. Of the die casting process, Monroe says, "It allows freedom of design while maintaining good quality and assembly methods."

20TH CENTURY DESIGN: U.S.A.

POSTAL SCALE BY PITNEY-BOWES, INC.

. . . uses die castings, extrusions





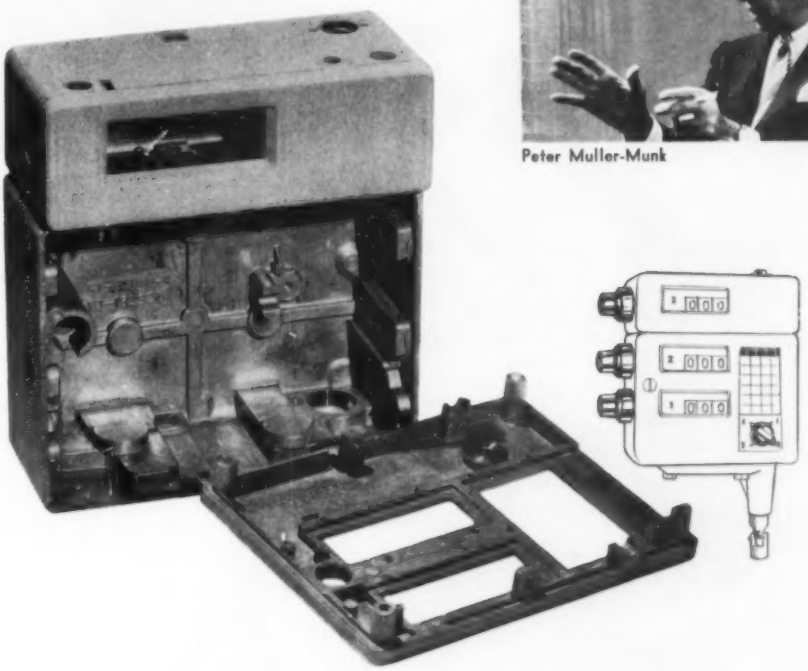
A POSTAL SCALE has to be accurate. It has to retain its accuracy for a long time, and it has to have a professional look. The kitchen scale won't do. Some mail rooms are in nice dry climates, well away from bodies of salt water and free of industrial fume. But most of them aren't, and the postal scale has to function accurately under some pretty bad ambient conditions. So, Pitney-Bowes, Inc., put only materials which could "take it" into their postal scale. When a part corrodes, its weight changes and the mail clerk isn't going to rebalance his scale every day. If a knife edge corrodes, accuracy is gone. Then there's dimensional stability. Unequal, unexpected, and uncompensated changes in length will ruin the scale. To avoid all the pitfalls to which scales might be heir, a combination of die castings and extruded sections were used. The main housing is a die casting which has been designed to permit rapid assembly and easy cleaning. The poise had to have high mass in a small package, so a chromium-plated lead die casting was specified. The balance weight and the knife, or pivot, both required extreme dimensional and weight accuracy, so brass extrusions were specified. Cost, of course, was important, but less so in this case than dimensional and weight accuracy and stability.

PICK COUNTERS on textile machinery are primarily functional devices, and design may be considered secondary. And yet, here's proof that such a device can embody good design while serving its functional purpose. This three-shift, reset pick counter manufactured by Veeder-Root, Inc. achieves its function-plus-design features by using die cast cases and covers. Finish of these parts is further enhanced by shrivel baked enamel. The counter was designed by Peter Muller-Munk Associates, one of the few international design firms. Peter Muller-Munk, founder and managing partner, has served as both president and chairman of the board of the American Society of Industrial Designers.

RESET PICK COUNTER BY VEEDOR-ROOT, INC.

. . . uses die castings

Peter Muller-Munk

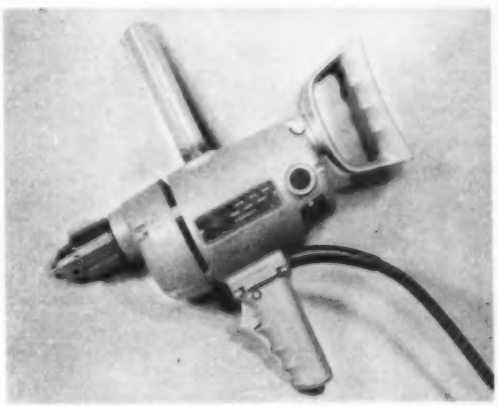


WHEN GARTH HUXTABLE designed this electric drill for Millers Falls Co., it was under the assumption that production of this model would probably be rather limited. At the same time, however, the drill had to be designed for rough treatment. A 1/2" capacity electric drill is heavy, and the housing for the motor and reduction gears must, therefore, be an integral part of the drill, not just a shroud. To get the best strength-to-weight ratio, aluminum had to be the metal and permanent mold casting was the only logical choice of fabricating method. Huxtable is particularly well suited to design this type of product. He has had over 20 years experience in the design of industrial and utility tools, furniture, radio and television cabinets, barbecue grills, and a host of other products. He has found that such precision molding methods as permanent mold casting give him the necessary flexibility with both quality and minimal cost.

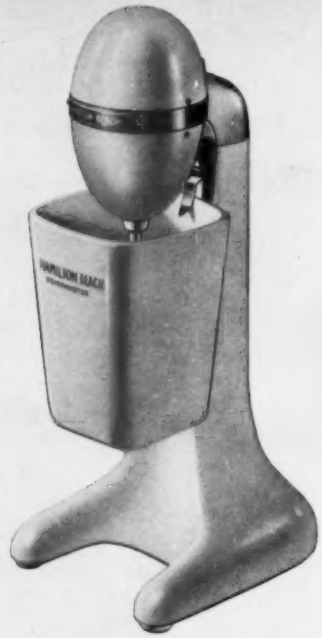
ELECTRIC DRILL BY MILLERS FALLS CO.

. . . uses permanent mold castings

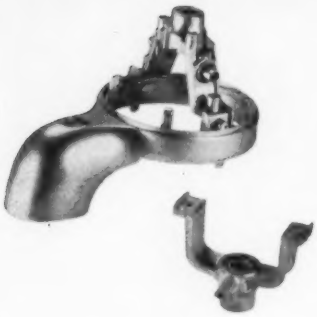
Garth Huxtable



20TH CENTURY DESIGN: U.S.A.



ELECTRIC APPLIANCES
BY HAMILTON BEACH CO.
. . . use die castings

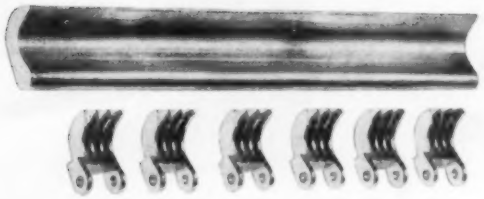


FOR WORK OR FUN, these two electrical appliances do their job and combine utility with smart looks. Made by Hamilton Beach Co., the Hand Vav vacuum cleaner and the Drinkmaster drink mixer both use die castings. Hamilton Beach gives six reasons for using die castings: (1) initial low cost, (2) minimum machining required, (3) suitability to finish (painting, plating, anodizing, etc.), (4) freedom from corrosion, (5) minimum weight, which is essential in most home appliances which must be transported or handled, and (6) intricacies of shape not possible with other fabricating methods, and which provide flexibility of function as well as design appearance. Supplier of the die castings is Electric Autolite Co.

STEAM IRON BY GENERAL ELECTRIC CO.
. . . uses permanent mold and die castings

Alfred W.
Wakeman

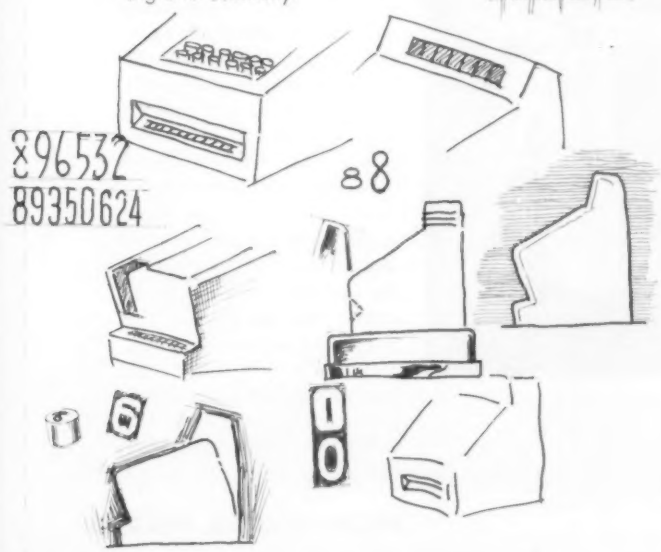
THIS STEAM AND DRY IRON has a soleplate which is a permanent mold casting, and a steam chamber cover which is die cast. The designer, Alfred W. Wakeman, used an unusual method for developing the steam iron. He made four or five clay study designs which were revised with engineering in consultation. Two were chosen and made into finished appearance models for market survey. Then, final refinement was made and contour drawings and patterns were supplied to engineering. In this way, there was no compromise when the design came up against the economics of production tooling.



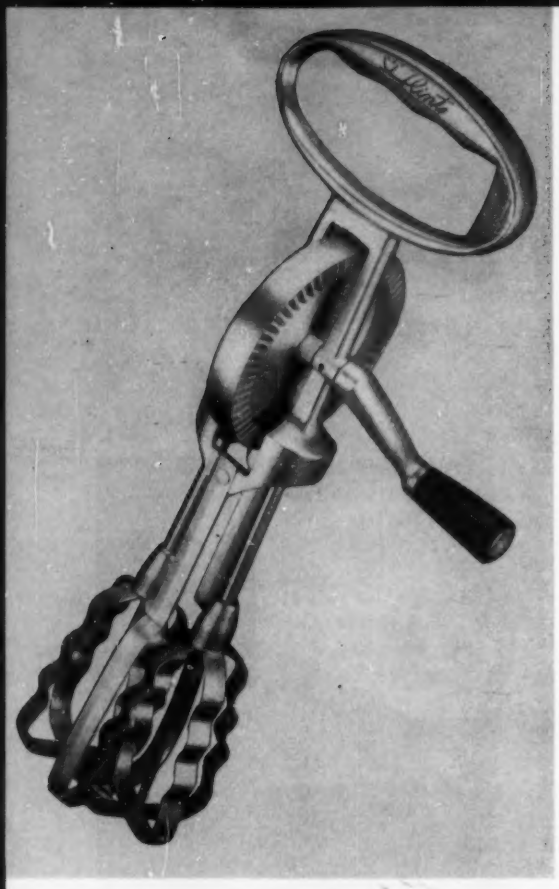
CASH REGISTER BY THE NATIONAL CASH REGISTER CO.
. . . uses die castings, extrusions, sinterings

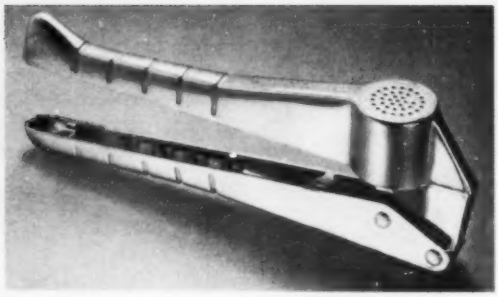
PAUL M. KOONS, who designed the cash register shown here, is head of the Styling-Design Dept. at The National Cash Register Co. He's been designing since 1926.

THIS CASH REGISTER was designed with a family resemblance to other products in The National Cash Register line of machines. Although there are fewer applications for PMM parts for ornamental purposes, the myriad of complex precision parts in the functional phase of these products is unusual in industry. Type wheels and printing hammers are die cast; counter feed pawls are extruded; gears, links, and locks are sintered. These processes were chosen because of the complexity of the parts, and because they gave more faithful reproduction in printing and economy.



IMPORTANCE of precision metal molding is emphasized by Koons, who says, "As the artisan or craftsman of yesterday created objects of utility and beauty for the few, so the industrial designer of today has put them within the reach of many. Keeping abreast of changes in materials, methods, and desires is the responsibility of his art; to its many challenges he must bring ingenuity and taste."

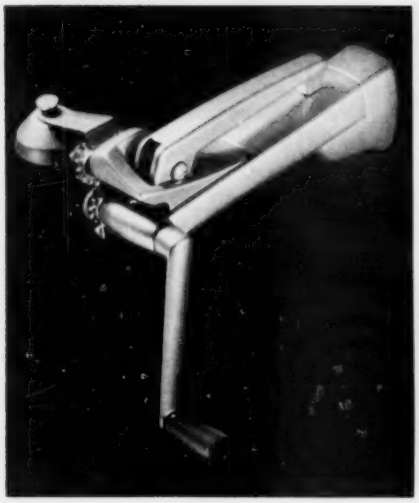




20TH CENTURY DESIGN: U.S.A.

KITCHENWARE BY EKCO PRODUCTS CO.

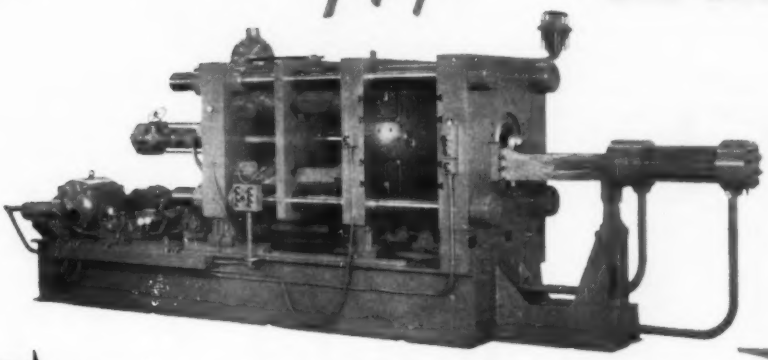
. . . uses die castings



WHAT FACTORS make a good kitchen appliance or utensil? Smooth, long-time operation; easy cleaning; easy operation; pleasing appearance. These all add up to good design. The food mixer, garlic press, and can opener shown emphasize these points. Mrs. Housewife shops for such items by picking them up to determine how they feel, if the operation is smooth, and if they seem easy to clean. What made her stop and pick them up in the first place? Good overall design. It isn't hard to make a product which fulfills all our requirements, if cost isn't considered. But the products have to sell competitively. That's why Ekco Products Co. makes wide use of both zinc and aluminum die castings in their products. These castings permit the designer to develop the best functioning part at a minimum cost. Smooth surfaces, comfortable handling, easy cleaning —the great attributes of die cast parts.

The STANDARD *Hydraulic* SYSTEM OF B & T

DIE-CASTING MACHINES



1. MEETS J. I. C. SPECIFICATIONS!

...a very important consideration in comparing both price and performance. For, this superior system of panel mounted hydraulics eliminates unsupported valves and threads between high pressure connections... permits very easy removal of valves for repair or replacement.

2. ELIMINATES LEAKAGE LOSSES!

Non-inflammable hydraulic oil is expensive and leakage losses are costly. With the B&T STANDARD system, loss of oil is negligible. Pipes have weldon fittings, socket welded to flanges which are bolted together with an "O" ring seal between mating surfaces to prevent leaks. Leaks cannot be caused by the normal hydraulic surges of a die casting machine because B&T uses heavy, rigid piping clamped firmly to the base at frequent intervals.

3. CUTS MAINTENANCE COSTS!

The B&T method of piping also saves time in disassembly, since it is only necessary to remove 4 bolts at each end of a pipe to free it from mating cylinders or parts.

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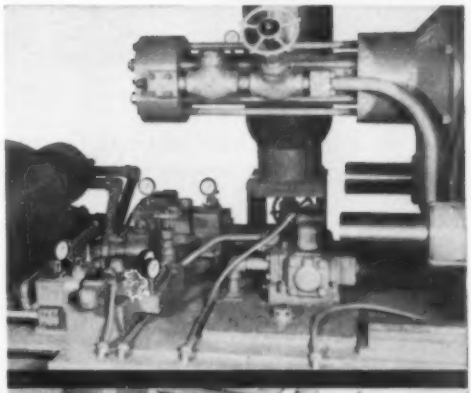

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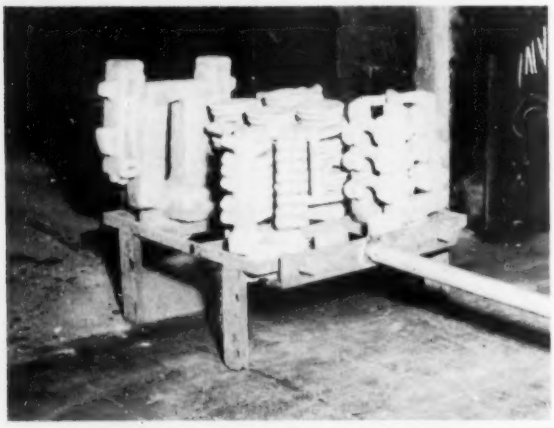
Investment Casting in Shell Molds

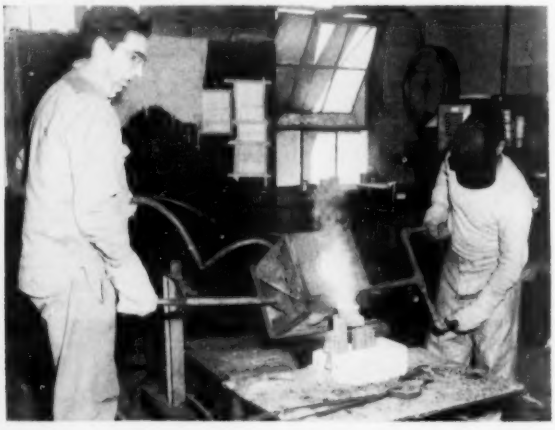
Part II: Alumina Base Ceramic Shells

PATTERN IS DIP-COATED WITH ALUMINA GRIT . . . . . .

. . . . THEN MOLD IS FIRED FOR 1 to 1½ HOURS . . . .



. . . . AND CAN BE POURED IMMEDIATELY OR LATER.



By F. C. QUIGLEY and B. BOVARNICK*

ADVANTAGES of a thin-walled mold are: reduced time for melt-out and firing schedules, increased cooling rate of cast metal, savings in material costs, and extension of size limitations.

Several processes have been reported for preparing molds of this class. Because of Ordnance interest in precision castings, Watertown Arsenal has developed molding materials and processes that could reduce time and costs.

These are the most important properties of a mold for producing quality castings:

- Sufficient refractoriness.
- Mechanical strength in both the green and fired states.
- Chemically inert to liquid metal.
- Production of good casting surface.

Characteristics of the mold-forming process are:

- Ease of mold preparation.
- Economical manufacturing procedures.

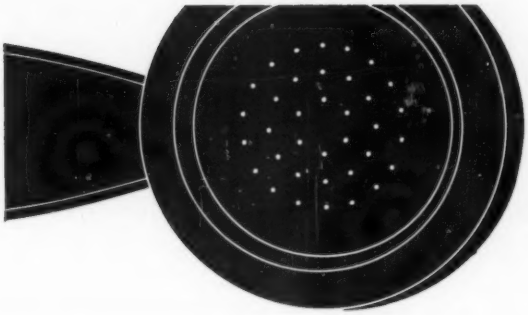
The first essential in manufacturing thin-walled molds is selection of a suitable refractory. The primary requirements for the material are refractoriness, low cost, and availability. Aluminum oxide meets these requirements and offers several processing advantages. Aluminum oxide can be prepared readily as a slip that is easily deflocculated and will remain stable during long periods of standing.

A dried alumina slip has good green strength and can be sintered at a practical temperature in a short firing cycle. As a compound, Al_2O_3 has excellent chemical stability and is inert to molten metals common to steel casting. Of the several crystalline phases, the alpha phase of Al_2O_3 – the high temperature structure – does not transform during heating and cooling and is preferred for ceramic shells. These characteristics can be realized in slip-formed alumina pieces.

The need for accurate registration of pattern detail led to use of a liquid slurry composed of an alumina-base slip characteristic of high-temperature ceramics. The practical requirements for a successful slip are distinct from those normal to ceramic practice. The mold-forming slip should have an extended shelf life. It must form an adhesive coat on the pattern and permit mold wall buildup. It should not crack on drying. The dried mold requires green strength to withstand handling and volitilization of the organic additions, and it should sinter to a smooth mold surface. Various slip compositions have been studied in order to satisfy these conditions.

continued on page 44

*METALLURGISTS, RODMAN LABORATORY
WATERTOWN ARSENAL



STAMPING,
6 OPERATIONS:

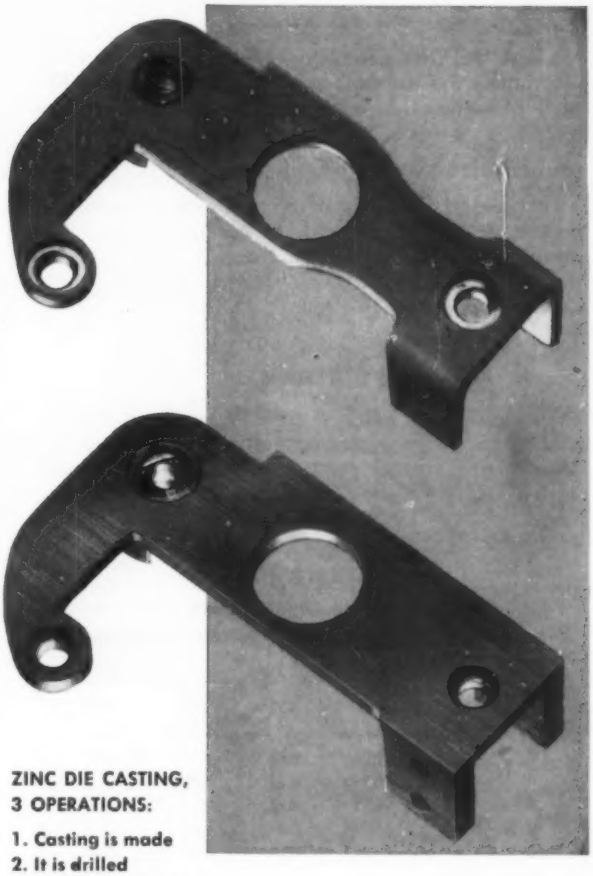
1. Blanked and pierced
2. Formed
3. Drilled
4. Reamed
5. Drilled again
6. Tapped

ZINC DIE CASTING

Cuts Costs 63%

• The parts shown here are dial bridges used in telephones made by Stromberg-Carlson at Rochester, New York. Originally made as brass stampings, production and assembly required 6 operations. Redesigning the dial bridges for die casting in zinc reduced the number of operations in half. The switch to zinc base die castings cut production and assembly costs 63%. In fact, cost figures indicated that the savings on the first 24,000 components would pay for the needed retooling necessary to convert to die casting. Comparable savings have been achieved by utilizing the die casting process for other methods of manufacture.

• This case history again proves that zinc plus die casting is one of the fastest and most practical low-cost production tools available to the country's metal-working industries.



ZINC DIE CASTING,
3 OPERATIONS:

1. Casting is made
2. It is drilled
3. Holes are tapped

DIE CASTING is the Process...ZINC, the Metal

...BUNKER HILL, the Preferred Zinc

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Iron Carbon System in Powder Metallurgy

Part II: Effects of Atmosphere Composition

EDITOR'S NOTE: Last month, P. Ulf Gummeson described how the iron carbon system is affected by the quality of the iron powder and the graphite, and outlined some requirements for graphite.

TWO IMPORTANT FACTORS to consider when controlling the atmosphere composition are equilibrium conditions (carbon potential) and reaction velocities (rich versus lean gas).

EQUILIBRIUM CONDITIONS

One reason the atmosphere plays such an important part is, of course, the risk of decarburization. The reactions to be in equilibrium are:

1. $CO_2 + C \rightleftarrows 2\ CO$
2. $CH_4 \rightleftarrows C + 2H_2$
3. $H_2 + CO_2 \rightleftarrows H_2O + CO$

It's almost impossible to predict exactly if a given atmosphere is going to be carburizing, neutral, or decarburizing in the furnace. The composition will change with temperature, load of the furnace, and gases given off the parts being sintered. Consequently, the atmosphere might be entirely different in composition and in effect in various parts of the furnace.

It's helpful to know the characteristics of the individual equilibrium reactions. While the CO_2:CO ratio can be fairly high at all temperatures without causing oxidation of the iron, the ratio must be very low to prevent decarburization at sintering temperatures. At lower temperatures, the CO_2:CO ratio can be permitted to increase considerably without causing either oxidation or decarburization.

In other words, the CO constituent decreases its carburizing effect with increasing temperatures. This is contrary to the CH_4:H_2 ratio. The CH_4 increases its carburizing effect with increasing temperatures. This means that at any practical temperature it takes only small amounts of CH_4 to cause carburization.

The CO_2 content in the system Fe-O-C will have to be kept very low to permit the formation of iron carbide at practical sintering temperatures. In the system Fe-C-H, each equilibrium is strongly toward carburization (carbide formation) at all practical temperatures for CH_4 contents as low as 1%. Finally, there's the influence of dewpoint for a normal endogas. The moisture content is more strongly decarburizing at the lower temperatures.

All gases mentioned are present in the furnace. While it is impossible to diagram the ultimate equilibrium conditions, it is possible to calculate the theoretical gas compositions which would be in equilibrium with eutectoid steel at 2050°F. These calculations have been made for 0, 40, and 80% nitrogen and for 0 and up percent of hydrogen, carbon monoxide, and carbon dioxide. They are shown in Table I.

In all practical gas compositions, the methane content and the dewpoint will have to be kept low. Three additional compositions are listed at the bottom of Table I. They are practical for laboratory work and will create the desired equilibrium at 2050°F.

There's an interesting feature in this calculation. Cracked ammonia consists of 75% hydrogen and 25% nitrogen. Forgetting the inert nitrogen, the atmosphere may be considered 100% hydrogen. Thus, theoretically, it would be practical to sinter iron carbon parts in very dry cracked ammonia. In practice, this works well if the furnace is run at equilibrium conditions—completely dried out and the load of iron carbon parts high and uninterrupted. The parts themselves create the gas constituents that protect against decarburization. Cracked NH_3 also has the advantage of being strongly reducing.

continued on page 50

TABLE I

SINTERING ATMOSPHERES

Composition of gas mixtures (% volume) in equilibrium with eutectoid steel at 2050° F.

N_2	H_2	CO	CO_2	CH_4	H_2O
0	0	99.56	0.44	0	0
0	20	79.554	0.28	0.006	0.16
0	40	59.58	0.16	0.02	0.24
0	60	39.64	0.07	0.05	0.24
0	80	19.72	0.02	0.10	0.16
0	99.85	0	0	0.15	0
40	0	59.84	0.16	0	0
40	20	39.84	0.07	0.01	0.08
40	40	19.88	0.02	0.02	0.08
40	59.95	0	0	0.05	0
80	0	19.98	0.02	0	0
80	10	9.984	0.004	0.002	0.01
80	19.994	0	0	0.006	0

The following compositions will theoretically create the desired conditions when heated to 2050° F.

N_2 = 0%	N_2 = 40%	N_2 = 80%
H_2 = 88%	H_2 = 54%	H_2 = 12%
CO = 12%	CO = 6%	CO = 2%

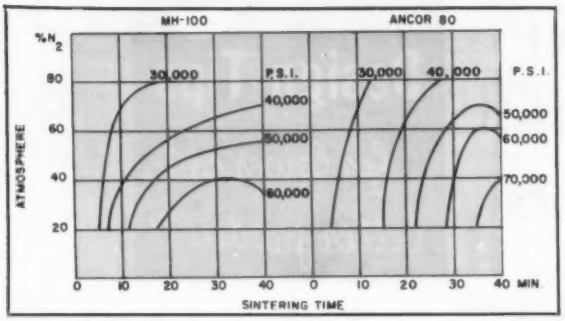


FIGURE 1. Transverse rupture strength vs. sintering time and atmosphere.

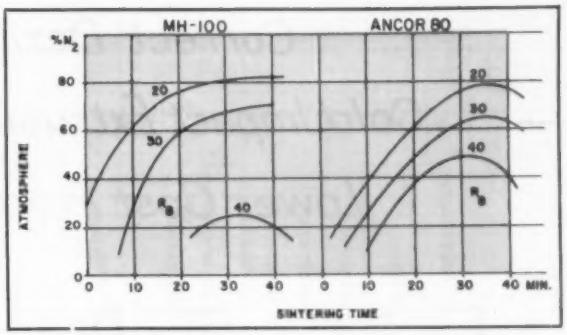


FIGURE 2. Hardness vs. sintering time and temperature.

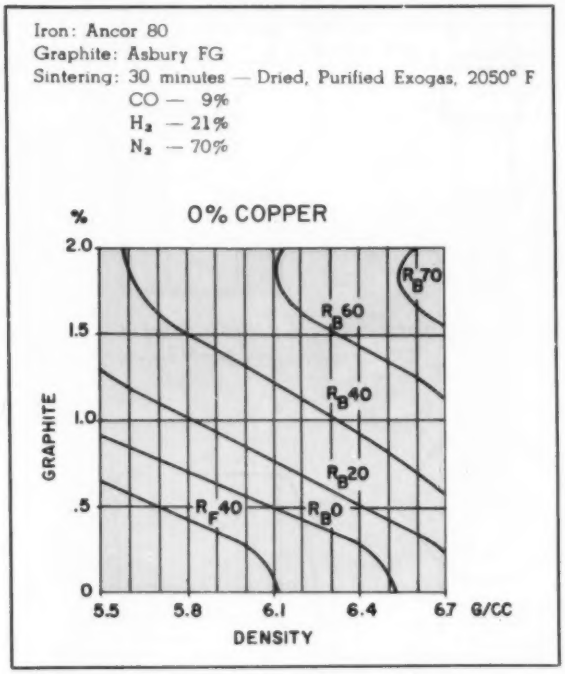


FIGURE 3. Hardness vs. graphite addition and density.

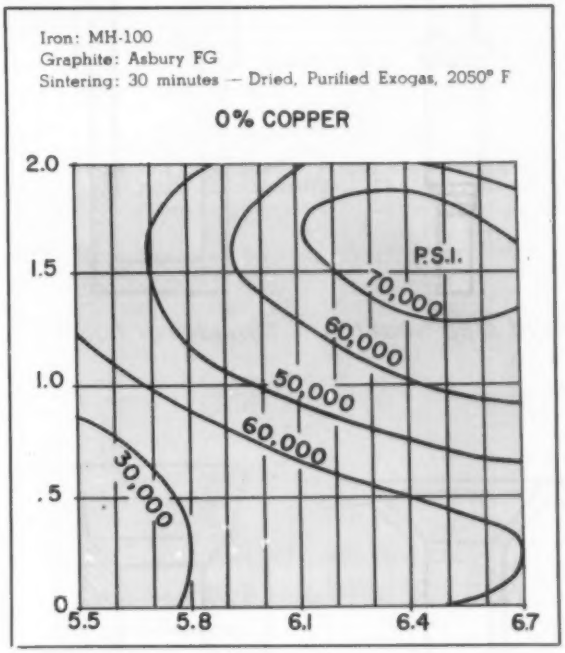


FIGURE 4. Transverse rupture strength vs. graphite addition and density.

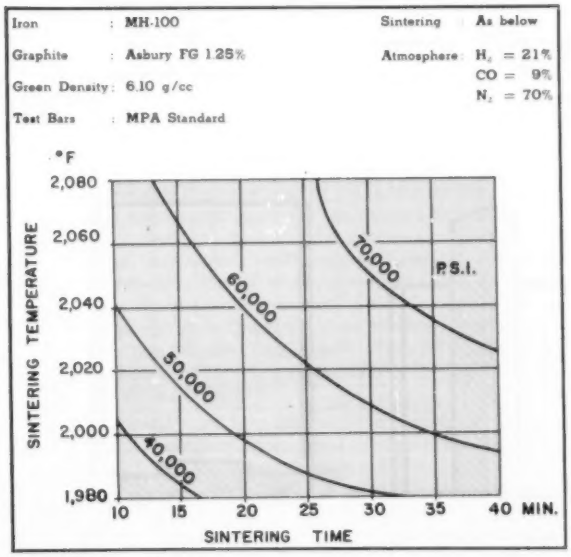


FIGURE 5. Modulus of rupture vs. sintering temperature and time.

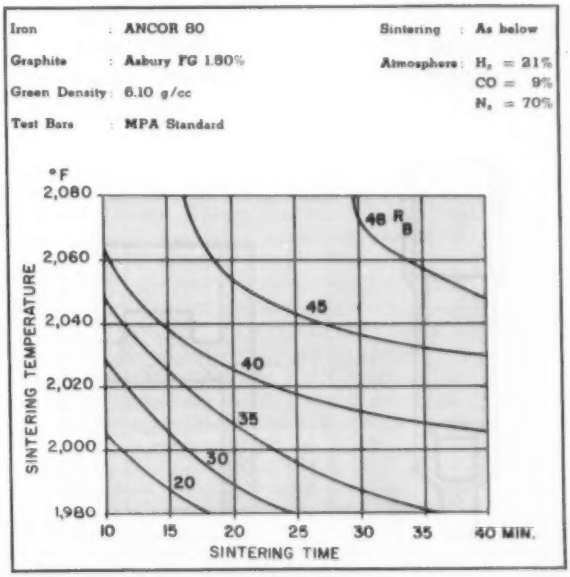
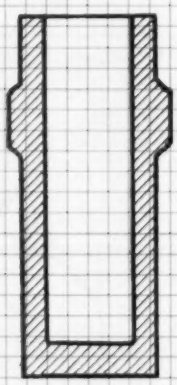


FIGURE 6. Hardness vs. sintering temperature and time.

Correct Design + Cold Impact Extrusion = Lower Cost Products

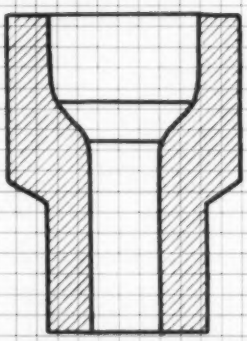
use these PMM **Design Tips** for lower costs - better products

Solid step shaft

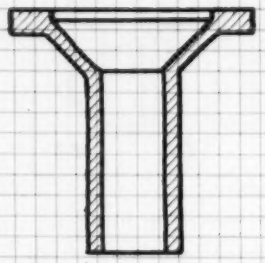


Cylindrical bodies

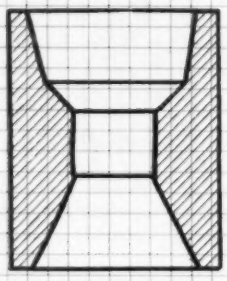
Solid step shaft



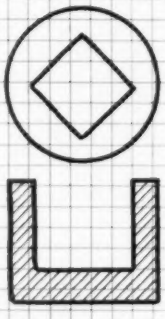
Cylinders with varying wall thickness



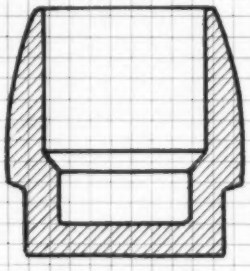
Solid and hollow flanged parts



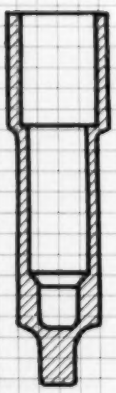
Cylinders with varying wall thickness

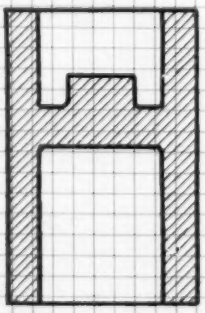


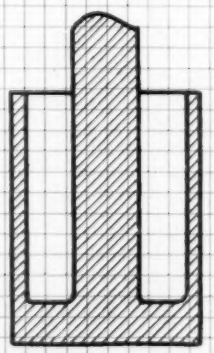
Geometric shapes

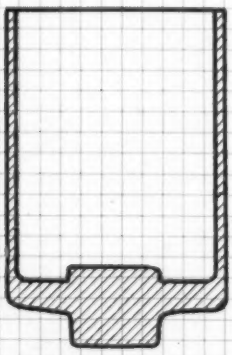


Ogives and conical shape









Cylinders with internal and external embossments

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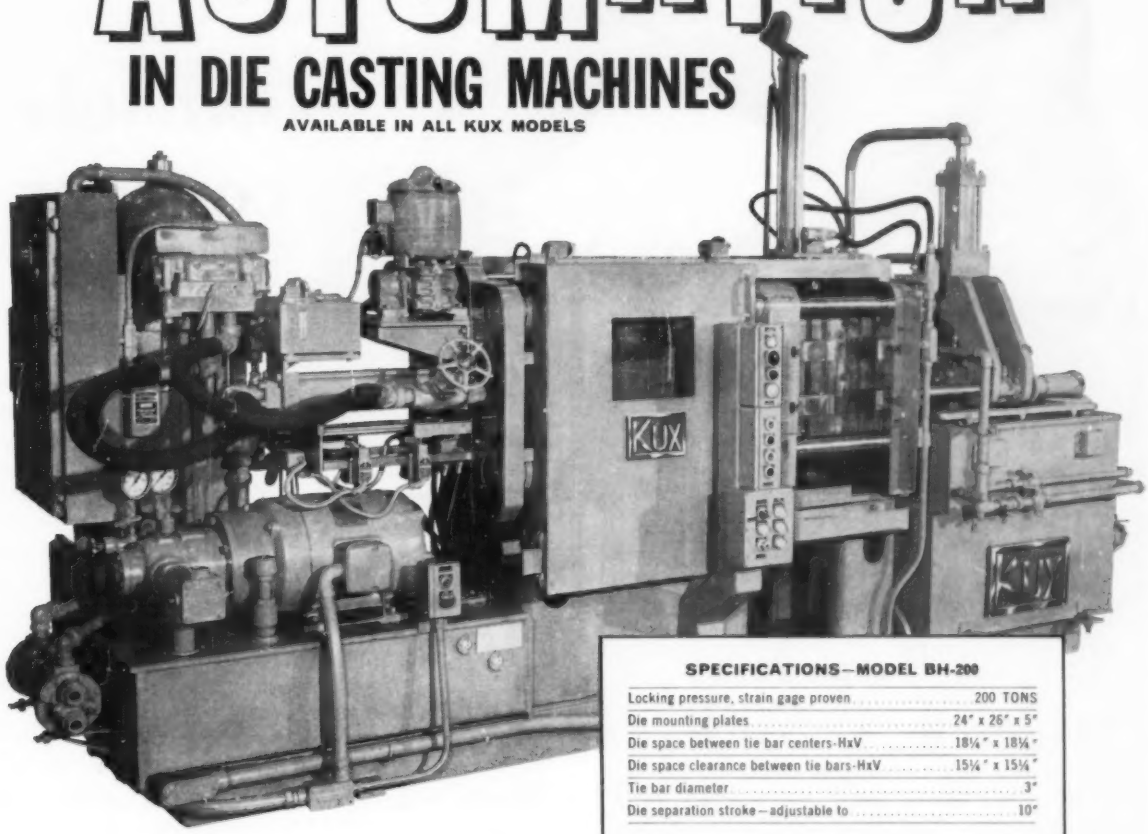

SPECIFICATIONS—MODEL BH-200

Locking pressure, strain gage proven	200 TONS
Die mounting plates	24" x 26" x 5"
Die space between tie bar centers-HxV	18¼" x 18¼"
Die space clearance between tie bars-HxV	15¼" x 15¼"
Tie bar diameter	3"
Die separation stroke—adjustable to	10"

Up to 900 free cycles per hour...
500 to 700 casting cycles per hour } AUTOMATICALLY — CONTINUOUSLY

You're looking at the new KUX Model BH200—the 200-ton strain gage proven hot chamber die casting machine, which will continuously produce vast quantities of hardware finish castings with minimum maintenance and down time. Automatic operating mechanism permits a cycle with a full 10" of die movement and 6" of metal injection stroke in 4 seconds. A 6¼ lb. zinc shot can be produced in this heavy duty machine at 1800 PSI injection pressure. Sensing safeties retract the die plate and prevent recycling of machine if there is flash on the die surfaces.

Incorporated into this machine cycling mechanism is a low pressure approach of the moveable die plate, flash sensing switches, air jets for cleaning die faces, casting sweep arm, and die lubricating unit with adjustable interval timing. Also available in cold chamber models for casting aluminum with KUX "AUTO-FEED" system of vacuum die casting.

ADDITIONAL FEATURES in the 28 all-new strain gage proven KUX models are the revolutionary "VAC-U-DIE" and "AUTO-FEED" systems of vacuum die casting—motorized die height adjustment mechanism—and the patented KUX injection pressure multiplier for cold chamber models with injection pressures up to 36,000 PSI and plunger speeds up to 12,000 inches per minute.

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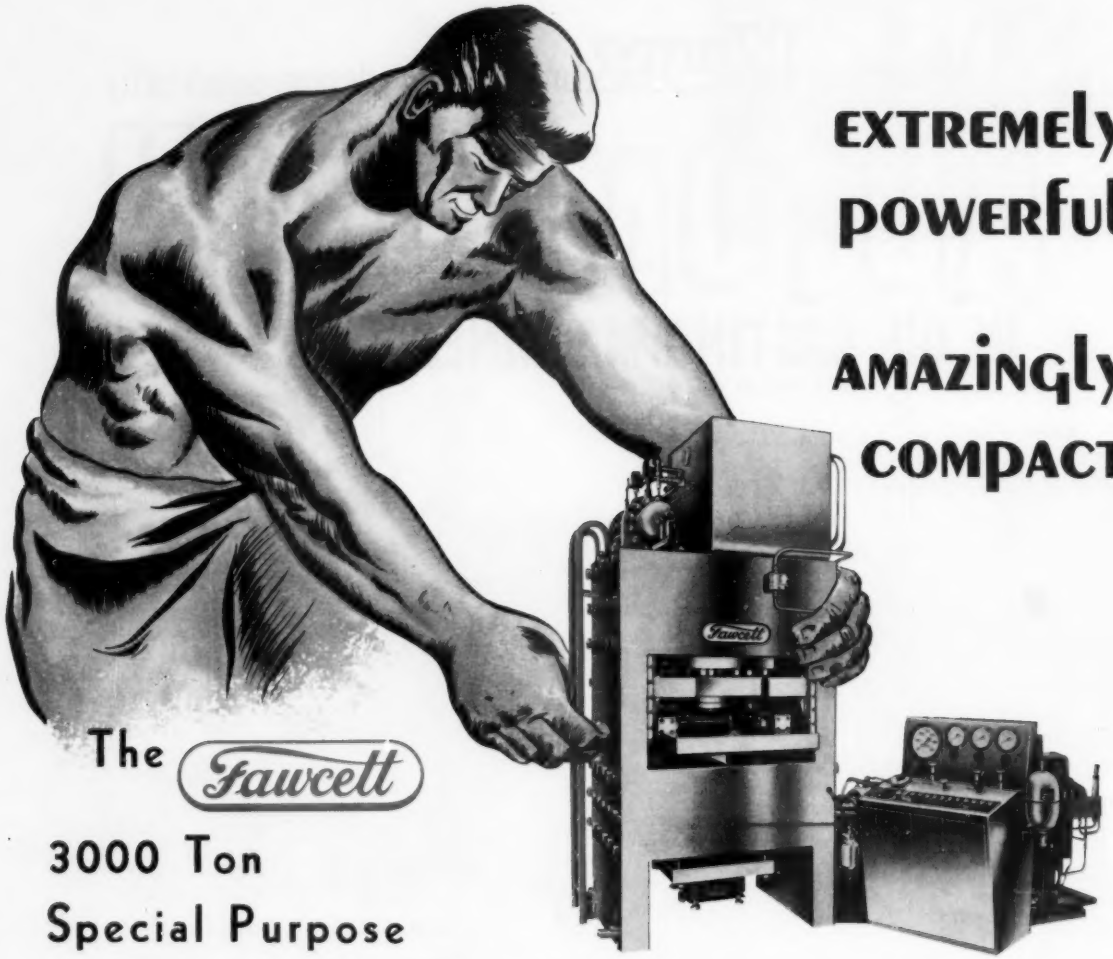

EXTREMELY POWERFUL

AMAZINGLY COMPACT

The Fawcett 3000 Ton Special Purpose Hydraulic Metal-Powder Compacting Press

This is the largest capacity press on the market, yet its dimensions are only 5'7¾" x 4' x 14'2". The Fawcett Compacting Press is designed to produce parts up to 18" in dia. or 254 sq. in., with a maximum filling depth up to 2", or to your particular requirements. It features gentle, smooth handling of components and deflection-free pressure which practically eliminates machining in most instances.

Specifications

Output—80 pressings per hour.

Press Load Dwell—the dwell of the main ram on final compression can be adjusted up to 30 seconds from an automatic timer.

Stripping Load—an adjustable pressure control valve provides the required holding pressure to facilitate the stripping of the moving table.

Press Control—automatic cycle or individual movement from selective push buttons.
A flow control valve is incorporated to give varying approach speeds of the filling die dispenser and main ram.

Press Load—up to 3,360 tons.

Drive—50 H.P. Motor.

Overall Dimensions—the press, including oil supply tank, is 14'2" high, 5'7¾" wide and 4'0" deep. With the motor, pumps and control desk, the machine requires a floor space of 10'0" x 12'6".

Total Weight of press including oil tank, etc. is 35 tons.

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PMM

The specialized finishing methods, equipment and materials used to machine, assemble, surface condition or surface coat precision metal molded parts are presented here. This includes all secondary operations which convert a raw casting to a finished product.

Finishing Section

Selection and Use of Coated Abrasives

By HAROLD HICKEY*

GOING TO USE coated abrasives for grinding or finishing die castings or other non-ferrous parts? To select the right abrasive for a specific job, you should review the composition of these abrasives, how they are affected by contact wheels, and what general conditions you should create to use them efficiently.

THE ABRASIVE GRAIN

First, to choose the proper grain — either silicon carbide or aluminum oxide — you must know something about the grains themselves. Not only do they look different, but there's a wide difference in the way they act while grinding.

ALUMINUM OXIDE, as used in coated abrasives, is dark brown or reddish brown. The color may vary, but it's easy to recognize. The grain's shape is rugged and blocky. Its characteristics under grinding pressure are:

- It is harder than all natural abrasive material except diamond, but not as hard as silicon carbide.
- It is very abrasion resistant, but will wear down to a smaller size. High spots will wear off.
- It is fracture resistant and generally does not break up into smaller pieces.
- It usually produces a wide, shallow scratch.

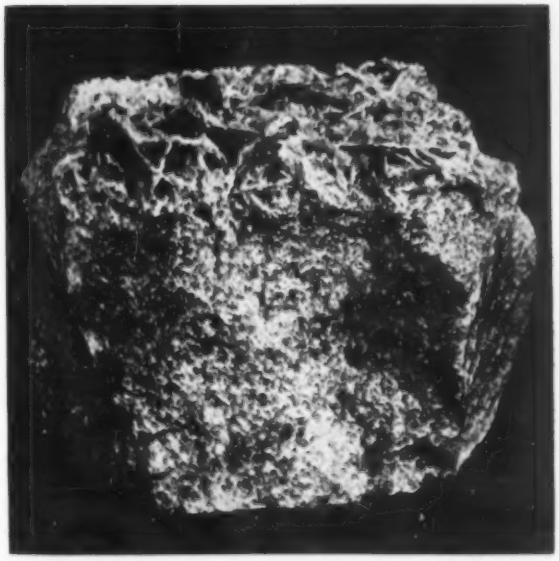
SILICON CARBIDE is blue-black or almost black. It's bright, shiny, and jewel-like, with very sharp edges. Its characteristics under grinding pressure are:

- It produces a narrow, deep scratch.
- It is very brittle and, as point pressure is increased, it fractures into a smaller, still-sharp piece.
- It is very hard, being the hardest man-made abrasive now in use (not, however, as hard as diamond).
- It has high wear and abrasion resistance.

TYPES OF BONDING, BACKING

For metal grinding and polishing, the abrasive grains are bonded to either paper or cloth backing

*ABRASIVE ENGINEER, TECHNICAL BRANCH
COATED ABRASIVES DIV., THE CARBORUNDUM CO.



ALUMINUM OXIDE grain is brown, has a rugged, blocky shape.

SILICON CARBIDE is blue-black, shiny, with sharp edges.

by: (1) the gravity coating method, with its controlled sifting of grain onto a backing material coated with liquid adhesive, or (2) the electrocoating method which orients the grain by upward projection. Both methods apply an even coating of grain. The electrocoating method causes the smaller, sharper sides of the grain to stick up, making a sharp coating especially desirable in finer grits.

Paper backing is a long-fibre, heavy-duty type that will withstand a lot of flexing and abuse and still hold the grain in place. The heavier paper backings are used for light belt grinding jobs, while lighter weights are used for disc and hand sanding.

There are two types of cloth backing. "X" backing cloth, which is heavy and stiff, is used where large quantities of stock are removed and where little flexing is required. "J" backing is lighter and more flexible in all directions.

Three variations of the bond itself give different degrees of moisture resistance, heat resistance, and durability: (1) glue, (2) resin over glue, and (3) resin over resin.

The bond affects grinding action by making the coating more or less resistant to attrition or wear. Resin bond tends to make belts one grit size coarser and produces a deeper scratch, grit for grit, than glue bond.

EFFECTIVE CONTACT WHEEL GRINDING

For maximum efficiency in contact wheel grinding with an abrasive belt, it is necessary to reach a condition where a little more severe dressing action of the work piece against the belt will cause controlled breakdown of the bond and grain, or—conversely—a little less dressing action will start glazing or dulling. This condition is called the point of breakdown.

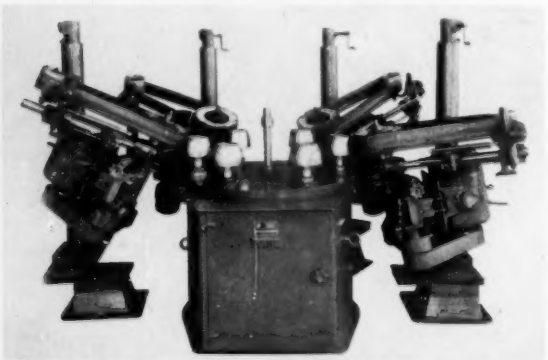
The point of breakdown can be reached by using the correct grain, bond, and backing combination at the proper work pressure. While variation of a grain, bond, and backing combination is limited, there's a wide variety of contact wheel face shapes.

These contact wheel face shapes were developed to change the unit pressure per square inch that a given work piece will exert against the belt with a given in-feed force. In effect, if the work piece itself does not dress the abrasive belt enough to keep it open and cutting, this dressing action can be increased or decreased by changing the face shape of the contact wheel.

The dressing action produced on the belt is directly related to the average amount of work area in direct contact with the belt at one time. You can increase or decrease this unit pressure against the belt on the contact wheel side of the belt by making the lands and grooves wider or narrower. The greater the effective unit pressure per square inch exerted against the abrasive belt, the faster the belt breakdown will take place and the faster the stock removal takes place—also the deeper the scratch.

You can evaluate grinding efficiency, where stock removal only is concerned, from the condition of a worn-out belt. If it has a shine or, load condition on the face, a more aggressive contact wheel will remove more stock and lengthen belt life.

On the other hand, if the belt shells or sheds grain excessively, a less aggressive wheel should be tried. However, remember that it's desirable to have an occasional grain break out of a belt.



AUTOMATIC rotary abrasive belt machine is likely to be harder on belts because of hammering vibrations and sudden shocks.

ABRASIVE BELT LUBRICATION

You must use lubricants for effective grinding of non-ferrous metals with coated abrasive belts. Lubricants will: (1) improve finish, (2) reduce depth of scratch, (3) reduce horsepower consumption, (4) reduce heat, (5) reduce tearing of metal and promote grinding, and (6) impart a more appealing light reflection or color to the metal.

Most floor stand grinding units use a grease stick specially prepared for this purpose. It's enclosed in a cardboard tube and is ground away by the belt when applied. This lubricant has a low melting point, so heat created in grinding will cause it to flow.

In the oil drip method, liquid lubricant applied to the back of the belt flows through the backing to lubricate the grind. In other cases, liquid lubricant is applied by a regulated spray under air pressure, either automatically or manually.

CARE OF ABRASIVE BELTS

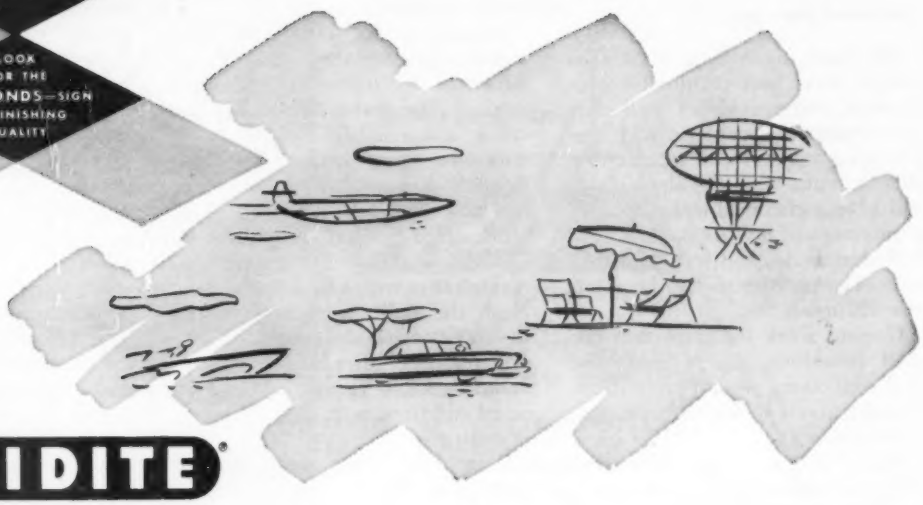
Be sure to use lighter pressures on new belts. Heavy pressure on a new belt can cut its overall life in half. In automatic operations, the operator should remember to compensate for belt wear by regulating the in-feed pressure on the machine.

Uneven pressures also will shorten belt life. Uneven pressure is more likely to occur in automatic polishing machines, because of the nature and construction of these machines. Belt heads may vibrate excessively, or the work piece may hit the belt hard. These hammering vibrations and sudden shocks cause the belt to wear abnormally.

When mounting belts on a machine, don't fold them over or subject them to uneven tension. Either of these may cause local bond breakdown and a short belt life.

Although proper storage cannot increase belt efficiency, improper storage can decrease it. Ideal storage conditions are 40% to 60% relative humidity and 60° to 80°F temperature. In winter, top shelf storage is not desirable in rooms heated with hot air. Avoid damp basement storage.

LOOK FOR THE DIAMONDS—SIGN OF FINISHING QUALITY



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SHELL MOLDS

continued from page 34

The basic ingredients of the slips which have been evaluated are: alumina, water, feldspar, ball clay, gum arabic, hydrochloric acid, and a wetting agent. To be satisfactory, alumina must be in the alpha phase and have a chemical make-up with a minimum of 99% Al_2O_3, less than 0.5% iron oxide, and less than 0.5% soda. The powder should be a minus 325 mesh.

Current work indicates that the most promising slip is composed of the following weight proportions to make about 15 lbs. of basic slip:

Alumina	175.5	oz.
Water	45	oz.
Pot ash feldspar	12	oz.
Ball clay	7.5	oz.
Gum arabic	1.5	oz.

Preparation of slips with optimum reproducibility can be attained by the following method of mixing: The water is put into the crock and one-half of the Al_2O_3 with the gum arabic dispersed through it is added to the water and stirred in with a spatula. Two ounces of 3 Normal HCl is added, and the mix is drill-whipped several minutes with a high-speed disc. Next, the ball clay is added and the mix is again drill-whipped several minutes, after which the remaining Al_2O_3 is added in two equal additions, with drill-whipping in between.

The entire composition is then drill-mixed for 15 to 20 minutes and rolled overnight in a 5-quart container at 27 RPM. If, after this rolling, the Ph is adjusted to between 4.5 and 5, the slip can be used. Additional rolling would be required only if the slip has been idle for more than 8 hours, and it can be returned to a suitable consistency by rolling for 30 to 45 minutes. Observations indicate that, if properly prepared, its shelf life is indefinite.

The wetting agent is added just before the slip is used. It is generally a 75% solution of aerosol O.T. and is blended with a high-speed disc. Wetting agents have been found to have a very short shelf life in the slip, and daily replacement may be required.

The slip at this stage is extremely viscous and has a Zahn cup No. 4 reading of 50-60 seconds. The addition of wetting agent will lower the initial viscosity to 40-50 seconds. The slip viscosity may be adjusted to a workable range of 28-34 seconds with water before use. Retention of the higher viscosity is an advantage for slips to be held for extended periods.

MAKING THE MOLD

Manufacture of the mold begins by mounting the wax patterns as in the conventional lost wax process. Hollow wax plugs, sprues, and gates are used whenever possible. The assembly is completely immersed into the slip. It is removed and allowed to drain for a few seconds to prevent buildup on end points. It is then submerged into a fluidized bed of 90-mesh alumina abrasive grit. This gives a completely uniform coating of the refractory grain on the dip coat in less than one second.

After about a 20-minute drying period for the first coat, the mold is ready for the second coat. The slurry for the second, or backup, coat is the same basic composition as the precoat, but thinned with water to a Zahn cup No. 4 viscosity of 13-20 seconds. The setup is dipped into the thin slurry, drained, and immersed into the 90-mesh fluidized alumina bed. When the second coat has dried, the setup is dipped into the backup slurry and covered with a 46-mesh alumina, using the fluidized bed technique.

The mold wall is built up to de-

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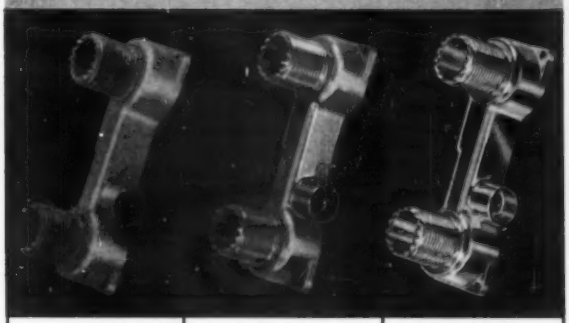

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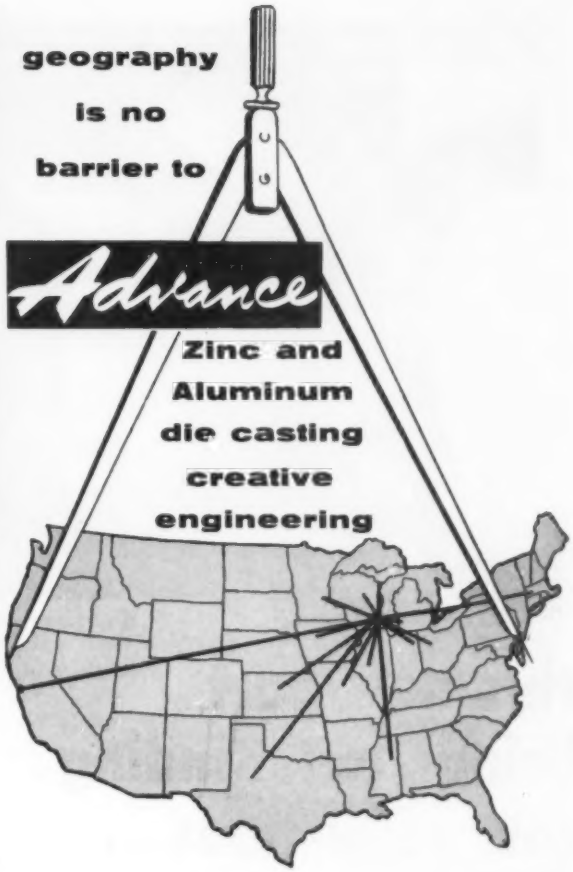

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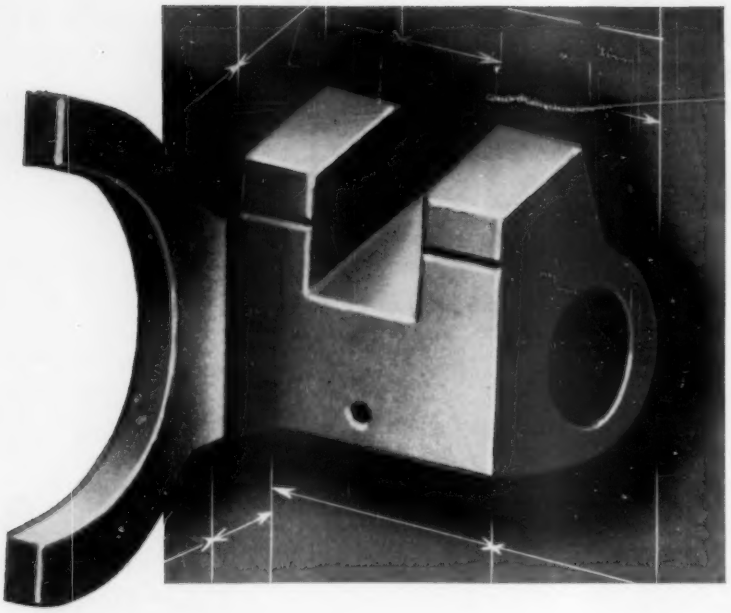

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sired thickness, repeating the same procedure. The drying time between dip coats is basically a function of the humidity of the room in which the operation is performed. The mold wall is normally composed of five layers, the grit in the first two being 90-mesh abrasive alumina, and 46-mesh in the last three for satisfactory mold strength. The viscosity of the back-up slurry may be found to give heavier wall buildup if it is in the range of Zahn cup No. 4, 20-25 seconds.

The mold is slowly dried before the melt-out and firing cycle. Overnight at room temperature with low humidity is satisfactory. Melt-out and firing may be done in any appropriate furnace that can sustain 1800°F. The practice has been to use a continuous operation, which requires a change of furnace temperature from 1600-1650°F to 1800-1850°F on going from melt-out to firing. Melt-out is done within three minutes. Firing, for one to one-and-a-half hours at 1800-1850°F, has been found necessary to develop requisite strength levels in a mold of this composition.

POURING THE MOLD

The sintered mold, with its thin wall, reproduction of wax pattern detail, and freedom from wax residuals, is ready for pouring. It can be poured immediately, cooled to some desired preheat temperature, or cooled to room temperature for storage and subsequent casting. It can be preheated to a desired temperature without difficulty when needed. Experimental molds have been poured at temperatures ranging from room to firing without mechanical failure.

Castings of several alloy steels have been made in these thin-walled sintered alumina molds. The surface quality of the castings is good, with excellent reproduction of wax pattern details. No evidence of surface reaction between metal and mold has been found.

Although the work has led to satisfactory mold-making methods, efforts to improve and extend the development are being continued. Observation and examination have shown good dimensional reproducibility of the castings, coupled

with satisfactory metallurgical qualities.

However, it should be noted that mold shrinkage is definitely greater than that in standard investment practice. Mold shrinkage has been regularly checked for more than six months and found dimensionally consistent. The shrink rule used for layout of the master pattern is 0.020-0.025 in./in., depending upon section geometry.

To summarize, this development appears to offer several desirable technical features:

1. It is an easily-formed, thin-walled mold.
2. It has the high refractory qualities necessary for casting low alloy steels.
3. It has good mechanical strength, requiring no backup in casting.
4. There is no evidence of mold metal reaction when casting.
5. It produces castings with good finish that are excellent reproductions of the wax pattern.

NEXT MONTH: The third and last part of this report will describe special glass-like shells. Last month, Part I covered silicate shells.

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USEFUL LITERATURE, CATALOGS, MANUALS

Qualified readers may obtain any of these free technical publications by circling the numbers on the Reader Service Cards facing Page 76

PROCESSES

145 **Extrusions** — PRECISION EXTRUSIONS, INC. — 12-page technical brochure gives latest information on aluminum alloys and the aluminum extrusion process.

146 **Sinterings** — MIDWEST SINTERED PRODUCTS CORP. — Brochure on high quality – low cost sintered brass nuts and washers.

147 **Die Castings** — LAFRANCE PRECISION CASTING CO. — 8-page brochure on die cast name plates, their finishing, uses, and design.

MATERIALS & EQUIPMENT

148 **High Strength Castable Alloys** — COOPER ALLOY CORP. — 10-page technical report on the superior molybdenum containing 18-8 type PH55 Alloys. Data on these corrosion, abrasion and erosion resistant castable alloys includes mechanical properties and composition ranges.

149 **Fluxes** — HARBOROUGH CONSTRUCTION CO. LTD. — 8-page technical manual on Harmark Fluxes for copper base alloys.

150 **Nickel-Base Alloy** — HAYNES STELLITE CO. — 12-page technical report gives data on Hastelloy alloy N a nickel-base alloy that can be extruded, drawn and forged.

151 **Manual Press Controls** — MICRO-SWITCH — 16-page catalog shows how Micro Switch Trip Control can be applied to manually operated air presses, stamping machines, etc.

152 **High Strength Steel** — ALLEGHENY LUDLUM STEEL CORP. — 24-page booklet on Potomac A High Strength Steel. This chromium-molybdenum-vanadium hot work steel is noted for its strength up to 1000° F.

153 **Stuccoing Equipment** — ALEXANDER SAUNDERS & CO. — Technical data on the Saunders Fluidized Bed Unit, a economical method of applying the refractory grain to build the shell mold in investment casting.

154 **Aluminum Alloys** — HENNING BROTHERS & SMITH, INC. — 8-page technical brochure is being distributed by the company on the various properties of Olin Aluminum alloys in pig, ingot and billet forms.

155 **Industrial Radiography** — PICKER X-RAY CORP. — 12-page booklet describes equipment and methods of radiographing all kinds of industrial products.

156 **Tool Steel** — THE UDDEHOLM CO. OF AMERICA — 8-page technical report on UHB Premo Tool Steel for making die casting dies for zinc and other metals with a low melting point.

157 **Castable Refractory** — PLIBRICO CO. — Technical data on Plicast 34 (R), a super-duty castable refractory material with a low-iron content. Especially suitable for controlled atmosphere furnace applications.

158 **Counting Devices** — VEEDER-ROOT INC. — 8-page brochure gives the advantages of including counting devices in the design of machinery.

159 **Temperature Conversion Chart** — THE ELECTRIC HOTPACK CO., INC. — Free, easy to read chart converts fahrenheit to centigrade, centigrade to fahrenheit instantly. Gives interpolation factors for fractional readings.

160 **Thermocouple Wells** — MINNEAPOLIS-HONEYWELL REGULATOR CO. — Catalog G102-1 gives necessary data to select the proper thermocouple well for any application.

161 **Die Casting Machines** — A.B.C. DIE CASTING MACHINE CO. — 12 page catalog on Air operated and Hydraulic operated die casting machines from 16 tons to 600 tons.

FINISHING

162 **Finish Remover** — BECK EQUIPMENT CO. — Technical data on Epoxystrip NC-194, a non-corrosive stripping agent that will remove difficult finishes but not corrode the metal product.

163 **Wetting Agent** — MACDERMID, INC. — Technical Data Sheet No. 94 describes Macro Wet 1, a liquid wetting agent effective in all chromate process for zinc, cadmium, silver and aluminum.

164 **Bronzeless Gold Finishes** — BEE CHEMICAL CO. — 8-page brochure on bronzeless gold spray finishes that are low in cost, non-tarnishing, non-gelling, and harder, and easier to apply.

165 **Water-Dilutable Stripper** — ENTHONE, INC. — Technical data on Stripper S-28, a chlorinated stripper for epoxy enamels which can be diluted with water.

166 **Plating Compounds** — METAL & THERMIT CORP. — Data sheets on Pelletized SRHS Chromium Plating Compounds that dissolve readily in water or plating solution.

167 **Black Oxide Finish** — MITCHELL-BRADFORD CHEMICALS CO. — Technical data on "Activated" Black Magic for producing a black oxide finish on steel.

168 **Powdered Pickling Compounds** — FREDERICK GUMM CHEMICAL CO., INC. — 4-page technical bulletin on powdered pickling compounds their uses and advantages.

169 **Finishing Systems** — THE DEVILBISS CO. — 4-page brochure on a line of complete automatic finishing systems. Includes spray guns, automatic spray coaters, flow and dip coaters, etc.

170 **Brightener** — MACDERMID, INC. — Technical Data Sheet No. 81 gives data on Electro-Gleam 55, a liquid acid material for brightening stainless steel, aluminum, and steel.

171 **Ultrasonic Cleaning** — OAKITE PRODUCTS, INC. — Bulletin No. 16A gives practical tips on how to get the most out of ultrasonic cleaning.

172 **Inserts** — HELI-COIL CORP. — Design manual and catalog on inserts for general commercial use and for military applications.

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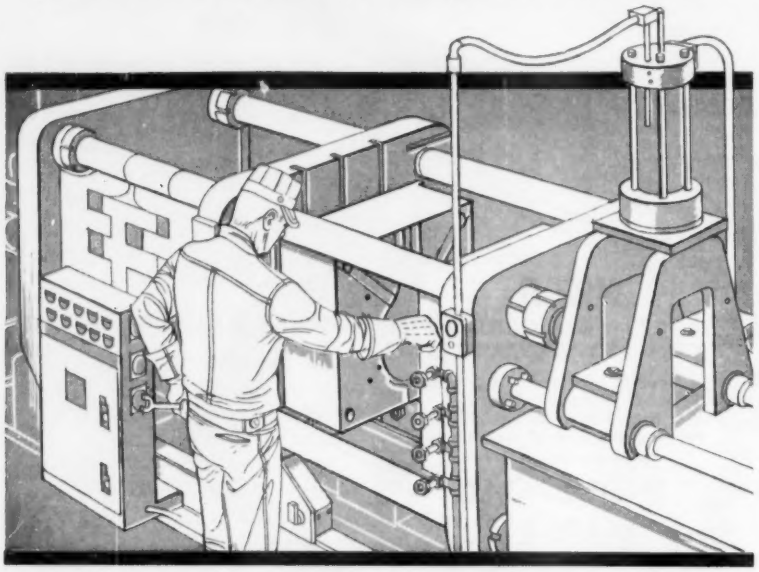

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IRON CARBON SYSTEM

continued from page 36

The fact that the gas is in equilibrium with the steel is not enough unless long sintering times of high sintering temperatures can be permitted. Also, the gas must be low in nitrogen.

Although the iron and graphite are intimately mixed and pressed together, diffusion of the carbon into the iron takes place primarily through the gas phase. Iron or iron oxide heated with graphite to normal sintering temperatures under vacuum are almost inert to each other.

REACTION VELOCITIES

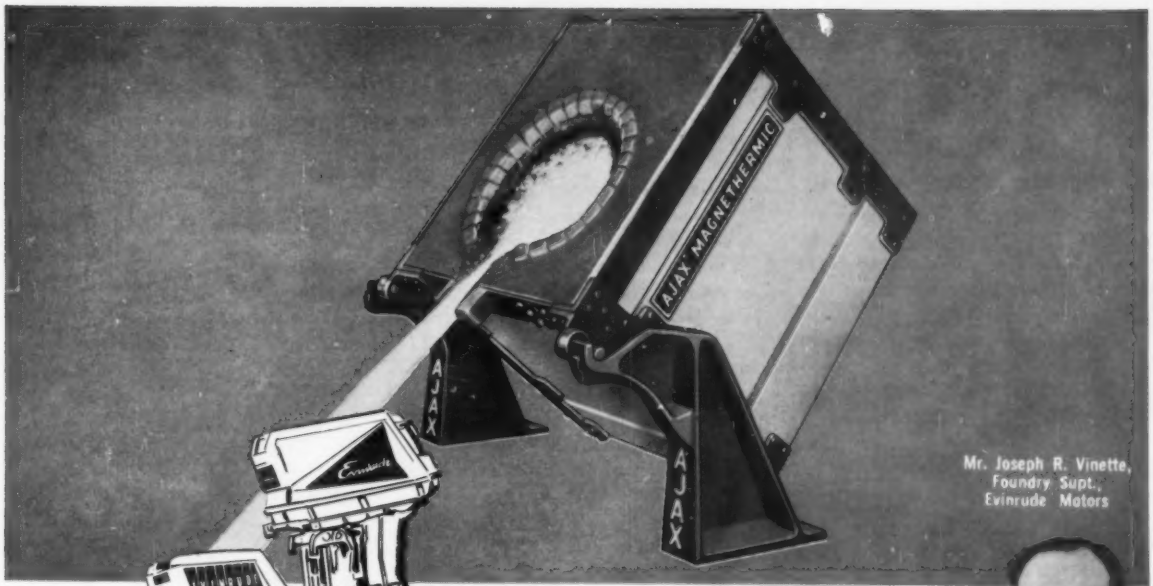
For example, purified exogas, which is lean and high in nitrogen, is easy to handle at high carbon potentials because of the low carburizing velocity. Rich gases, low in nitrogen, are more difficult to use at high carbon potentials because of the high carburizing velocity and because of their tendency to deposit soot. Figures 1 and 2 show the influence of inert nitrogen.

To summarize, here are desired conditions for manufacturing iron carbon parts:

- The iron should be reactive with carbon. That is, it should have good carbon pickup.
- The graphite should be natural, flaky, below 100 mesh, and with low ash content and good reactivity.
- The atmosphere must be controlled carefully and have as low nitrogen content as possible.
- Furnace load should be constant.

To show what can be expected if these conditions are fulfilled, Figures 3 and 4 give the results when iron carbon parts are sintered for 30 minutes in a dried and purified exogas. Figures 5 and 6 show influence of time and temperature.

Dimensions are determined largely by sintering conditions. As a rule, the faster the reaction between the iron and the graphite, the smaller the dimensions will be. These dimensions are fairly stable over a range of densities. With control of atmosphere, sintering time, and sintering temperature, dimensions will constitute no problem.



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"Our Ajax-Magnethermic induction furnaces, powered by motor generators handle this job well round-the-clock. In fact, no operating unit in the foundry has needed so little attention. Skilled help or time is at a minimum. An important extra advantage is the ability to use the same furnaces for different metals if we should ever have to change."

Discover for yourself what Mr. Vinette and others have found to be the key to reliable and economic melting. Ajax furnaces are available for melting ferrous and non-ferrous metals . . . from half-a-ton capacity to ten tons . . . powered by spark gap convertors, motor generators, or the new, fast-growing Multiductor. For details write AJAX ELECTROTHERMIC DIVISION.

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NEWS OF INDUSTRY & ASSOCIATIONS

activities of people, companies & groups in the precision metal molding industries

MAGNESIUM ASSOCIATION HOLDS ANNUAL CONVENTION

THE MAGNESIUM ASSOCIATION reviewed and projected the technology and trends in magnesium at its 15th Annual Convention in New York recently.

Copies of the complete proceedings of the convention are available for $5.00 each. Copies of individual papers cost $.50 each. Here are the papers presented at the meeting:

- *Recent Developments in Protective Finishes for Magnesium*, P. F. George.
- *Design and Producibility Considerations Which Dictated Magnesium in the T-55 Turbine*, R. W. Paulovich and William Freeman.
- *Production of "Net" Forgings in Magnesium Alloy HM 21*, W. A. Hamilton.
- *Corrosive Environments and Basic Design Considerations*, Dr. W. F. Higgins.
- *Why Calumet & Hecla Got Into the Magnesium Business*, H. Y. Bassett.
- *Applications of HK31 Magnesium Alloys Where High Temperature Properties Are Controlling*, C. P. King.
- *Stretch Forming Techniques and New Magnesium Applications They Create*, R. A. Lalli.
- *Short-Time Elevated Temperature Properties of Premium Quality Magnesium Castings*, Walter Gronvold.
- *Micro Miniaturization and Magnesium for the Space Age*, Jack Staller.
- *The Philosophy Behind a Cast I-Beam Destruction Test Program*, Walter Gronvold.
- *An Analysis of Engineering Evaluation and Quality Assurance Criteria Developed from Structural Tests of Magnesium Sand Castings*, T. C. McGill.
- *A Study in Producibility Development and Testing a Magnesium Landing Gear Door*, A. J. Iler.
- *Current Markets and Indicated Future Usage of Magnesium*, J. S. Kirkpatrick.
- *Future Materials Trends in the Aerospace Industry: What Role for Magnesium?* I. Stambler.
- *Industrial Installations Increase as Custom Design Sells Magnesium Grating*, M. Van Dyke.
- *Present Achievements and Desirable Goals of Magnesium Welding*, Willis Groth.
- *How Present Day Welding Equipment Has Widened Magnesium Applications*, Craig Sibley.

For copies of these papers, write The Magnesium Association, 122 E. 42 St., New York 17, N. Y.

The association was formed in 1943 as a non-profit organization to "promote the general welfare of the magnesium industry, of the members of the association, and all others affected thereby, and to develop and increase the use and acceptance of magnesium and its products."

GRANT

SINGLETON

Its officers are: Otis E. Grant, president; C. A. Howe, vice president; John Thomson, vice president; Norman Gzowski, treasurer, Jerry Singleton, executive secretary.

ICI ELECTS OFFICERS, HAS NEW DIVISIONS

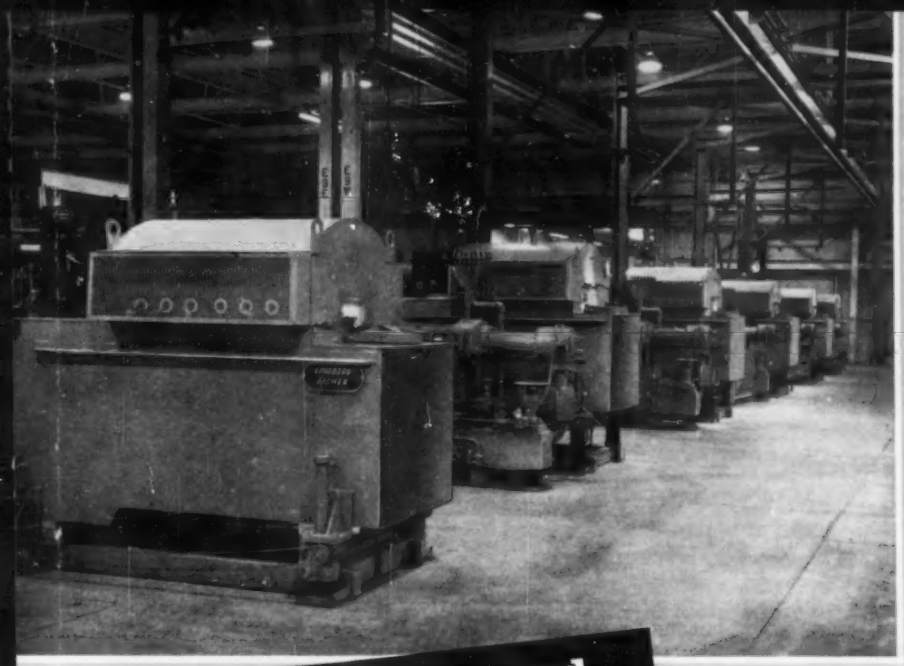
The INVESTMENT CASTING INSTITUTE, at its Seventh Annual Meeting held recently in Chicago, elected officers for the coming year and established two new divisions.

Elected were: President – John H. Morison, president, Hitchiner Mfg. Co., Inc.; vice president, management – Richard E. Gray, vice president, Gray-Syracuse, Inc.; vice president, technical – R. F. Waindle, president, WaiMet Alloys Co.; treasurer – L. R. Schwedes, coowner, Lawrence Laboratory.

New directors are: J. H. Cadieux, vice president, Casting Engineers, Inc.; P. J. Nilsen, president, Electronicast Div., Nilsen Mfg. Co.; W. A. Dubovick, president, Engineered Precision Casting Co.; Thierry N. Thys, vice president, Precision Foundries, Inc.; R. R. Miller, president, Precision Metalsmiths, Inc.

The new divisions set up by the ICI are the Technical Division and the Management Division. Essentially, the purpose of the Technical Division will be to help the industry produce higher quality castings; the Management Division to help obtain bigger markets.

ICI OFFICERS AND DIRECTORS: (front row, l to r) R. E. Gray, J. H. Morison, R. F. Waindle, L. R. Schwedes; (back row, l to r) W. A. Dubovick, J. H. Cadieux, R. R. Miller, P. J. Nilsen. Missing from this photo is T. N. Thys.



Lindberg-Designed

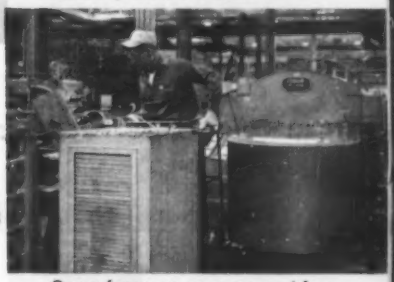
furnaces, more than 75 of them, help Ford Motor Company maintain casting production and quality standards

The new Aluminum Castings Plant of Ford Motor Company, Engine and Foundry Division, at Sheffield, Alabama, is a model of modern production efficiency. Contributing to its effective operation is a huge battery of Lindberg-Fisher aluminum holding furnaces, more than 75 of them. Eight large 65,000 lb. capacity reverberatory holding furnaces receive molten aluminum delivered from an adjacent Reynolds Metals plant and hold it at the desired temperature. Six other reverberatory furnaces, each with 20,000 lb. capacity, are used for remelting scrap aluminum from trimmed parts and holding metal at its usable temperatures. Molten metal is then delivered to more than 60 electric resistance holding furnaces in the casting area as needed. This unique installation, developed by Ford engineers in conjunction with Lindberg, is a major factor in maintaining the high quality product and production standards required by Ford.

Lindberg equipment and Lindberg planning can help you find the most effective answer to any problem of applying heat to industry. We cover the field, melting and holding, heat treating, tempering, brazing, enameling furnaces, ceramic kilns, high frequency units, and are in the ideal position to recommend just the type of equipment most suitable for your needs. This can be factory built or field-installed in your own plant, fuel-fired or electric. Consult your local Lindberg Field Representative (see the classified phone book) or get in touch with us direct. Lindberg-Fisher Division, Lindberg Engineering Company, 2463 West Hubbard Street, Chicago 12, Illinois. Los Angeles Plant: 11937 South Regentview Avenue, at Downey, California.

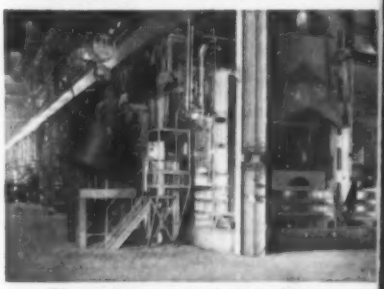
Handsome entrance to new plant of Ford Motor Company, Sheffield, Alabama.

Metal temperatures are positively controlled through Lindberg Control Panel.



Some furnaces are arranged for hand ladling and others are equipped with Lindberg Autoladle.

Molten aluminum is delivered direct to reverberatory holding furnaces.



The molten metal is held in these 14 huge furnaces for distribution to the casting areas.

LINDBERG heat for industry

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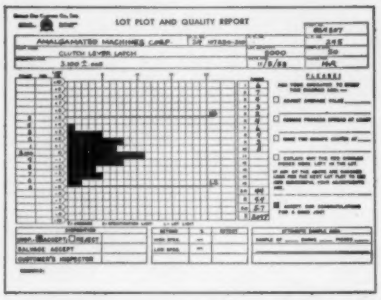

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INDUSTRY NEWS *continued*

ALUMINUM SMELTERS FIGHT SCRAP EXPORTS

Carl H. Burton, secretary of the ALUMINUM SMELTERS RESEARCH INSTITUTE, has charged that the U. S. Dept. of Commerce is stunting the growth of the aluminum smelting industry and "exporting American jobs as well" by allowing the export of scrap aluminum at a rate that may reach more than 50 million pounds this year.

The charge was made after the Dept. of Commerce denied an ASRI request to curtail the export of scrap aluminum. The original petition showed that aluminum scrap export jumped from 1.6 million pounds in 1950 to probably more than 50 million this year.

ZINC DIE CASTING DESIGN CONTEST OPENS

THE NEW JERSEY ZINC CO. has announced a competition for the best examples of lightweight, thin-wall zinc die castings used in product design. The awards will be made to the designer of the casting in the company using the die casting in its product.

The contest is expected to stimulate interest in imaginative and progressive use of zinc die castings in design or redesign of industrial and consumer products. Entries must be of unusually light construction. They will be judged on efficient utilization of the advantages of the die casting process, combined with the properties of zinc alloys where the product or components might have been made by other processes.

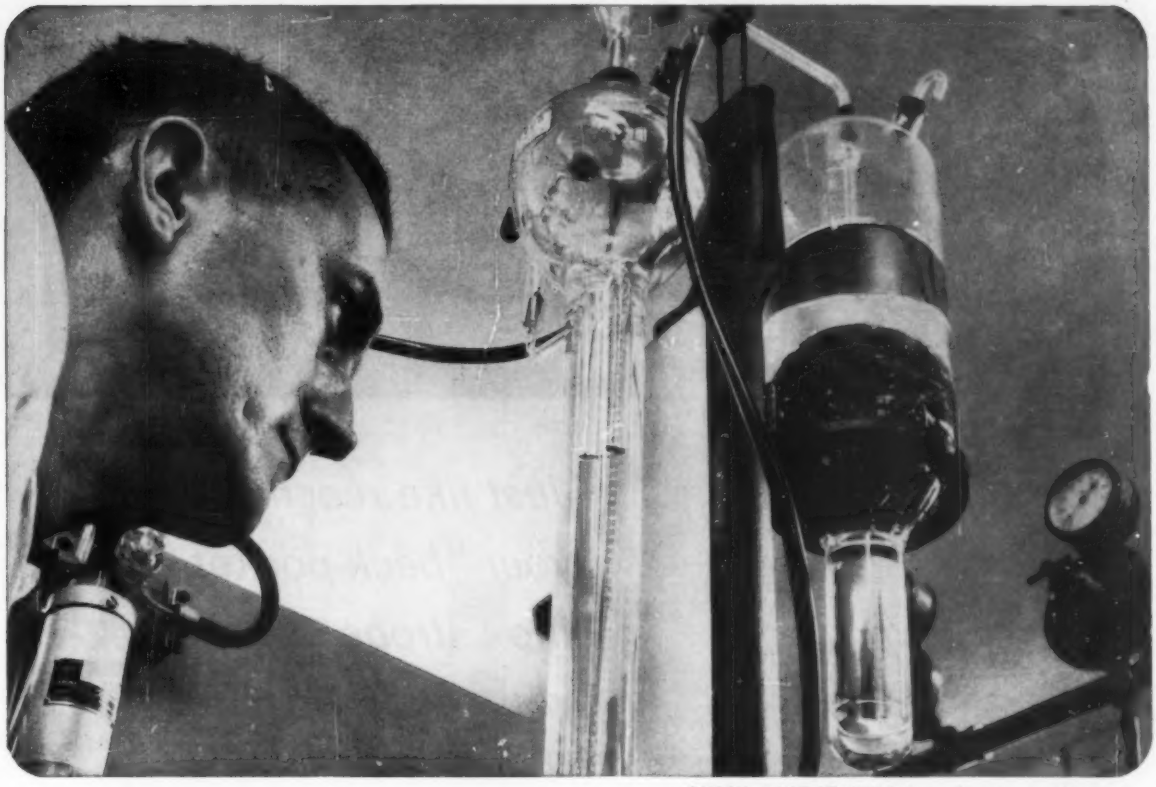
First award will be $200, second $100, and third $50. Get entry blanks and complete details from "Lighter Than You Think" Contest Editor, The New Jersey Zinc Co., 160 Front St., New York 38, N. Y. The contest closes January 31, 1960.

LAKE ERIE MACHINERY SOLD TO WHEELABRATOR

LAKE ERIE MACHINERY CORP. has been acquired by WHEELABRATOR CORP. Lake Erie Machinery will operate as a wholly-owned subsidiary, and will continue to produce hydraulic and extrusion presses for metal processing industries, and die casting machines.

Robert E. Dillon, former Lake Erie president, has retired. He's

***Experience**—the added alloy in **Allegheny Ludlum** tool steels*



QUICK, FAST TESTING for carbon content is done not once or twice but 8 times per melt in A-L's Chem Lab with this direct reading Leco carbon determinator.

Carbon content checked 8 times during melt to guarantee A-L tool steel hardenability

Lab tests for carbon eliminate your guesswork; provide high hardness, uniform hardenability, reproducible tool performance.

Because carbon has the greatest influence on hardenability, Allegheny Ludlum watches it carefully during the melt. Testing a specimen for carbon takes only a few minutes. Therefore, A-L checks for carbon content 8 times during the melt, and makes the necessary adjustments to insure accurate control of carbon. This control means Allegheny Ludlum can hold carbon content to a closer range than most customers specify.

Carbon control at Allegheny Ludlum assures you of precise response to heat treating. This control in the melt brings you predictable, *high hardness, uniform hardenability* and *reproducible tool performance.*

This is just one of the many things A-L does to insure high quality. Here are some others: close control over forging techniques, rigid temperature-time programming, careful testing of billets prior to processing to insure good surface and sound interior, control over annealing to give you the right hardness for your exact machining operation, thorough metallurgical testing to insure top tool steel quality and meeting of your specifications.

Allegheny Ludlum stocks a complete line of tool steel sizes and grades. Call your nearest A-L representative; you'll get quick service and counsel on such problems as heat treating, machining, grade selection, etc. Or write for A-L's publication list which gives full data on the more than 125 technical publications offered. They'll make your job easier.

***ALLEGHENY LUDLUM STEEL CORPORATION, Oliver Bldg., Pittsburgh 22, Pa. Address Dept.** PM-24*

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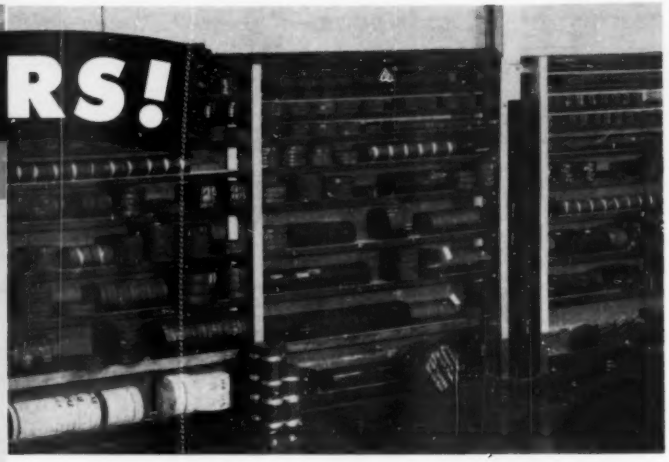

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been elected chairman of the executive committee. J. F. Connaughton, Wheelabrator president, also will be president of Lake Erie. Elmer A. Rich III is vice president and general manager of Lake Erie, and John M. Wolf has been named treasurer.

PMPMA ELECTS OFFICERS

At its recent annual meeting, the POWDER METALLURGY PARTS MANUFACTURERS ASSOCIATION elected these officers: President – Carl J. Demrick, president, Amplex Div., Chrysler Corp.; vice president – Smith Bolton, divisional president and general manager, The U. S. Graphite Co.; treasurer – G. G. Fellows, president, American Powdered Metals, Inc. Marshall E. Jetty, president of Brockway Pressed Metals, Inc., was elected to the board of directors.

MISCO SETS UP NEW DIVISION

MISCO PRECISION CASTING CO. has established a special division to serve the general industrial investment castings market. The division will have its own sales, service, engineering and production personnel, and facilities.

These appointments have been made in the division: Richard W. Arter, industrial sales manager; Harold J. Beauregard, plant superintendent; James C. Hall, chief engineer; William Warren, quality supervisor.

STERLING NAMES REP

STERLING, INC. producer of temperature control units, has appointed AIR-HYDRAULICS CO., Inc., St. Louis, its representative in Missouri and southern Illinois.

NEW REFRACTORY FIRM

HARBISON-CARBORUNDUM CORP. is a new company formed by HARBISON-WALKER REFRACTORIES CO. and THE CARBORUNDUM CO. The parent companies will pool their advanced refractories technology and sufficient financial resources to establish a jointly-owned subsidiary for engineering, manufacture, and sale of fused refractories.

Harbison-Carborundum's lines will include alumina, chromite, zirconia, and magnesia base refrac-

SINTER BRASS COMPACTS 20% STRONGER

with lithium stearate

Recent research indicates improved physicals for brass compacts using lithium stearate as a lubricant and nitrogen as the sintering atmosphere.

Typical results promise 20% stronger, 100% more ductile parts as well as safer, more economical sintering operations.

TRY IT NOW YOURSELF!

All you need is a special powder metallurgy grade lithium stearate (fluffy) available only from us. We'll send you complete facts and lubricant samples on letterhead request. Foote Mineral Company, 474 18 West Chelten Bldg., Phila. 44, Pa.

FOOTE MINERAL COMPANY

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3rd in a series of POWDERED METAL PARTS applications by REESE

COST AND SERVICE STORY

behind Reese Powdered Metal Knobs for Bernz-O-Matic Ceramic Grill

From John B. Spiggle, Purch. Agent for the Otto Bernz Co., Inc.: "Our present brass powdered metal knob was evolved from a smaller knob that was re-designed from a screw machine part to reduce cost. When we required a larger but similar knob on another product, we immediately thought of powdered metal. Reese received the order for this new part because their price and delivery were better than others who had quoted. We have continued to do business with Reese because their prices have been in line and their service and quality better than our other sources for powdered metal parts."

FREE BROCHURE "How to Cut Precision Parts Cost with the Remet Powdered Metal Process" shows how the Reese Corp. can help you. Send for your copy today.

Remet

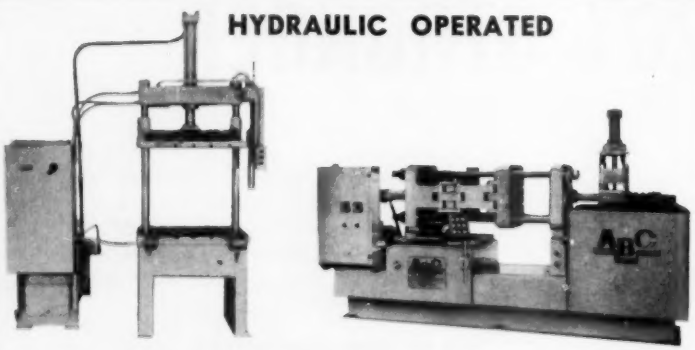
REESE METAL PRODUCTS CORPORATION

537 Howard Ave., Lancaster 10, Penna.

Gears • Pinions • Cams • Ratchets Oilless Bearings • Bushings • Machine and Structural Parts in COPPER • BRASS • IRON • ALLOY STEEL • NICKEL SILVER • COPPER INFILTRATED IRON

AIR OPERATED

HYDRAULIC OPERATED



Catalog available upon request

ABC DIE CASTING MACHINE COMPANY

400 East 142nd Street Dolton, Illinois

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INDUSTRY NEWS *continued*

tories, cements, and other auxiliary products.

The new firm will own and operate Carborundum's Monofrax fused refractory plant in Falconer, New York.

COMINCO PROMOTES TWO

THE CONSOLIDATED MINING AND SMELTING CO. OF CANADA LTD. has made these appointments: A. Olaf Wolff, formerly manager of the Metal Sales Div., is now director of research and development; Harold T. Fargey succeeds Wolff as manager of the Metal Sales Div.

FIELDER SUCCEEDS ERWIN LOEWY

FIELDER

Frederick A. Fielder has been elected vice president and general manager of BALDWIN-LIMA-HAMILTON CORP.'S LOEWY-HYDROPRESS DIV., succeeding the late Erwin Loewy who founded the company that became the Loewy-Hydropress Div. Fielder had been general sales manager and assistant general manager of the division since 1955.

You give food and friendship with every $1 package you send to the world's hungry thru the CARE Food Crusade, New York

Casting research on 17-4PH increases elongation 10% . . . costs Cannon-Muskegon customers nothing ¶ Cannon-Muskegon research has developed certain procedures for investment casting of 17-4PH that assure, consistently, the high level of properties which this alloy is capable of producing. ¶ Casting test bars in a keel block arrangement as shown here—rather than an end-gated arrangement—is one of them. Special recommendations on aging time and temperature are another. ¶ Further, Cannon-Muskegon research has demonstrated the necessity of stricter limits to provide a balanced chemistry and prevent harmful effects induced by too high or too low a content of certain elements. Keeping within these limits and following Cannon-Muskegon recommendations assures investment casters of consistently obtaining optimum performance from this fine alloy. ¶ We invite you to write for a free copy of the ICI Technical Research Report, "The Effect of Aging Time and Temperature on the Mechanical Properties of Investment Cast 17-4PH."

MASTERMET
AIR-MELTED ALLOYS

CANNON-MUSKEGON CORPORATION
Metallurgical Specialists • 2871 Lincoln Street • Muskegon, Michigan

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just to *stretch* a point.

. . . Next time specify

INVESTMENT CASTING

Parts design becomes as flexible as wax when you specify Investment Casting. Because with this "lost wax" process, parts can be designed for function; for utmost operating efficiency rather than compromised to satisfy a method of manufacture.

Costly machining and assembly operations are reduced and often eliminated. Complex and time consuming tooling setups too! And — you have the widest selection of alloys from which to choose: the non-ferrous group, the carbon and low alloy steels, the hard-to-form, hard to machine high alloy steels . . . even cobalt base alloys.

Thus you stretch your design potential, you stretch your range of metals and you stretch your budget when you specify this process.

It might stretch your imagination too, if you could see some of the intricate shapes we're casting here at Hitchiner. If you'll write us today for our free new brochure, you'll get an idea how you can utilize the freedom and savings offered with Investment Casting.

For complete details, see this new illustrated, informative booklet on the art of Investment Casting. It could be the best investment you ever made.

HITCHINER
MANUFACTURING COMPANY, INC.
MILFORD 45, NEW HAMPSHIRE
Representatives in Principal Cities

Circle No. 25 on Reader Service Card

NEW PRODUCTS

continued from page 12

MAGNETIC INSPECTION UNIT

FERRO MACHINE & TOOL CORP. — Ferroflux is a portable magnetic inspection unit that will locate discontinuities through painted or plated surfaces. The unit will not damage the part or provide danger to the operator.

Circle No. 256 on Reader Service Card

HYDROGEN PRODUCING SYSTEM

SELAS CORP. OF AMERICA — Complete processing systems for producing up to 10,000 cubic feet per hour of high purity hydrogen are available. Uses of the system include powder metallurgy; annealing ferrous and nonferrous metals, etc. Designed in capacities from 1000 to 10,000 cubic feet per hour, hydrogen purity up to 99.995% is possible. The system is fully automated for continuous processing without operating-supervision. The hydrogen facility is also completely instrumented.

Circle No. 239 on Reader Service Card

BARREL FINISHING MEDIA

TECHLINE DIV. OF WHEELABRATOR CORP. — A new pink quartz Type "Q" barrel finishing media has been introduced. It is finer textured than other quartz and its smooth surface permits its use in burnishing, substituting for steel balls. Cubical in shape, the media is available in sizes from 00 to 6.

Circle No. 240 on Reader Service Card

CLEANING COMPOUND

FREDERICK GUMM CHEMICAL CO. — Clepo 192-D is a tumble finishing material which removes oil, dirt and aluminum dust from small aluminum parts in a single operation. It produces a silvery, lustrous surface with sufficient lubricity to enable parts to slide freely during automatic feeding operations.

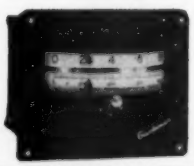
Circle No. 241 on Reader Service Card

REMOVES BUFFING COMPOUNDS

CONVERSION CHEMICAL CORP. — Kenvert Sluff-Off X is a synthetic detergent that will remove buffing compounds by soak or untrasonic cleaning from all metals without attack. This water soluble product

Albuquerque
Atlanta
Boston
Buffalo
Charlotte, N.C.
Chicago
Cleveland
Dallas
Denver
Detroit
El Paso
Hartford
Houston
Kansas City, Mo.
Los Angeles
Miami
Milwaukee
Minneapolis
Newark, N.J.
New Orleans
New York
Philadelphia
Pittsburgh
Portland, Ore.
Rochester, N.Y.
St. Louis
Salt Lake City
San Francisco
Seattle
Tulsa
Washington, D.C.

CANADA:
Hamilton, Ont.
Moncton, N.B.
Montreal, Que.
Ottawa, Ont.
Toronto, Ont.
Windsor, Ont.
Winnipeg, Manit.
Vancouver, B.C.



WHAT DOES BETTER TEMPERATURE CONTROL MEAN TO YOU?

It might mean greater accuracy . . . more consistent reliability . . . simplicity . . . elimination of vacuum tubes or possibly compactness or low cost. Another way, it could mean greater volume of production . . . improved quality . . . lower unit-costs. *Any* way, in many different fields, it means instruments by WEST.

Here and abroad we produce a wide selection of controllers, indicators and recorders for temperature and other variables, as well as complete systems and accessories. Our men in scores of cities offer qualified counsel. Write for Bulletin COM.

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SALES OFFICES IN PRINCIPAL CITIES

4357D W. MONTROSE, CHICAGO 41, ILL.

British Plant: WEST INSTRUMENT LTD.
52 Regent St., Brighton 1, Sussex

Represented in Canada by
DAVIS AUTOMATIC CONTROLS, LTD.

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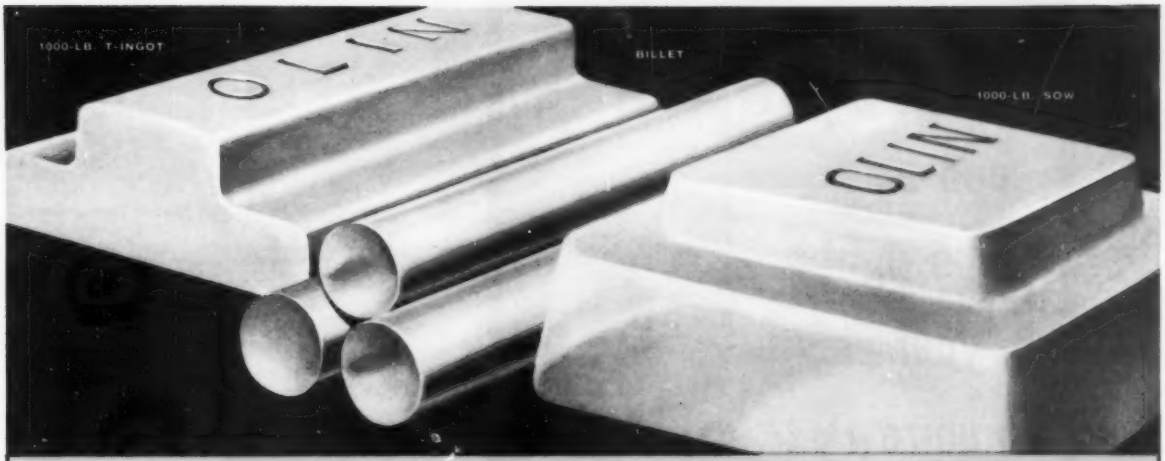
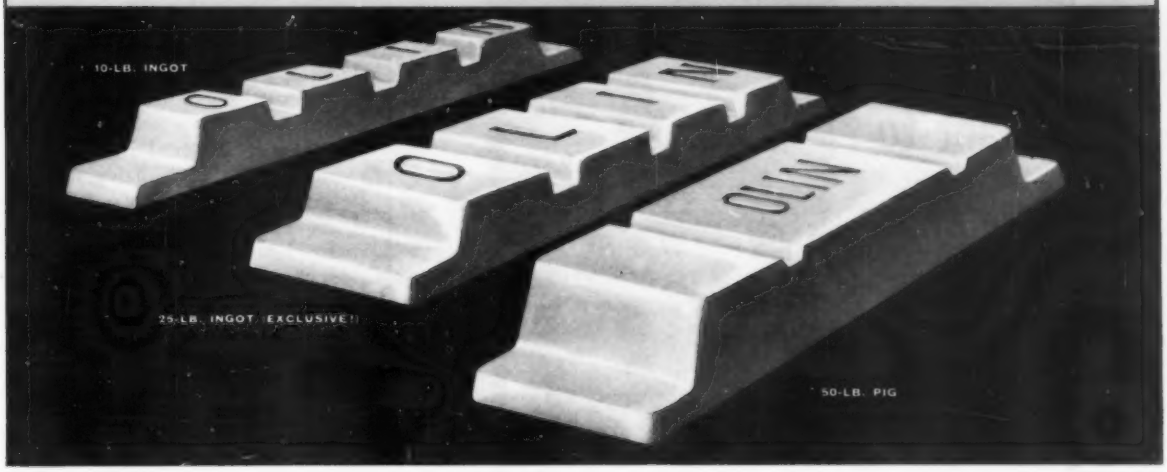


There's one for your every need

OLIN ALUMINUM PIG, INGOT AND BILLET



FOR EXTRUDERS

Pure pig in 50 and 1000 lb. sizes. **T-Ingot** in 1000 and 1500 lb. sizes. **Billet,** direct chill cast, in standard alloys, diameters and lengths, including log form. (Billet stock is supplied in special bundles to facilitate shipping and handling in your plant.)

FOR FOUNDRIES

Alloy pig and ingot, in standard alloys, in 10, 25 and 50 lb. sizes. (10 and 25 pounders offer exclusive benefits: smaller size to increase handling efficiency and speed melting; deep notches for easier breaking; 4-section design with smaller sections for faster crucible charging.)

FOR OTHERS

Pure pig, rotor ingot, custom alloys for special applications

You know what you're getting in Olin Aluminum. For this is primary metal—clean, uniform and with quality controlled by the most advanced techniques. So for dependable deliveries of pig, ingot or billet—call the Olin Aluminum Sales Office or distributor in your area.

SEE EDWARD R. MURROW ON "SMALL WORLD"—EVERY SUN. EVE., CBS-TV

OLIN ALUMINUM

OLIN MATHIESON • METALS DIVISION • 400 PARK AVE. • NEW YORK 22, N. Y.

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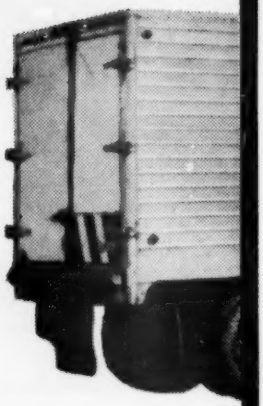
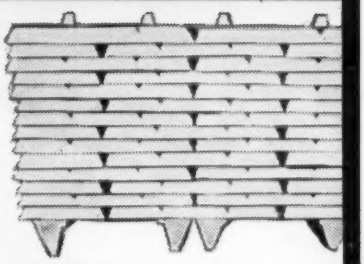
when you need zinc slabs right in your plant tomorrow*. . .



*Overnight truck delivery in eastern U. S.

and you want to conserve space & handling time . . .



Special interlock makes it easy to bulk pack and store

be sure to specify zinc slabs by GENERAL SMELTING

General's QUAKER brand Prime Western, IDEAL brand Brass Special and VICTOR brand Intermediate grade, fine quality Zinc Slabs will be in your plant tomorrow if you call today... And, as the photo shows, General's Zinc Slabs are specially produced to interlock for easy handling...made in 50 lb. slabs, packed 3000 lbs. to a bundle or to your special requirements...

CALL US TODAY GArfield 3-3200

GENERAL SMELTING CO.

2903 E. Westmoreland Street \ Philadelphia 34, Penna.

General Smelting Co. of Canada, Ltd., Hamilton, Ontario

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will remove compounds high in tallow, or where there are oily conditions from a wide variety of metals including aluminum, brass, steel, zinc die castings, etc.

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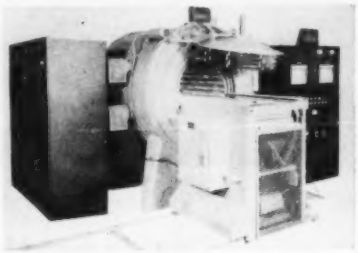
AUTOMATIC HEAT TREATING



IPSEN INDUSTRIES, INC. — A series of new automatic heat treating units has been introduced which operate at temperatures up to 2000°F. The units are designed for carburizing, carbon restoration, carbonitriding, neutral hardening, marquenching, normalizing, annealing and brazing. Features include: Automatic loaders; 1-piece normalized cast meehanite carging door and door plate; Silicone carbide hearth, side baffle and connecting arch.

Circle No. 243 on Reader Service Card

WATER DISPLACING LIQUID

ENTHONE, INC. — Water Displacing Liquid No. 1 is an organic solvent used for rapid shedding of water from metals. The solvent is said to promote rapid drying of metal parts by penetrating into crevices and holes and forcing water from the surface. The water settles to the bottom of the liquid and can be drawn off periodically.

Circle No. 244 on Reader Service Card

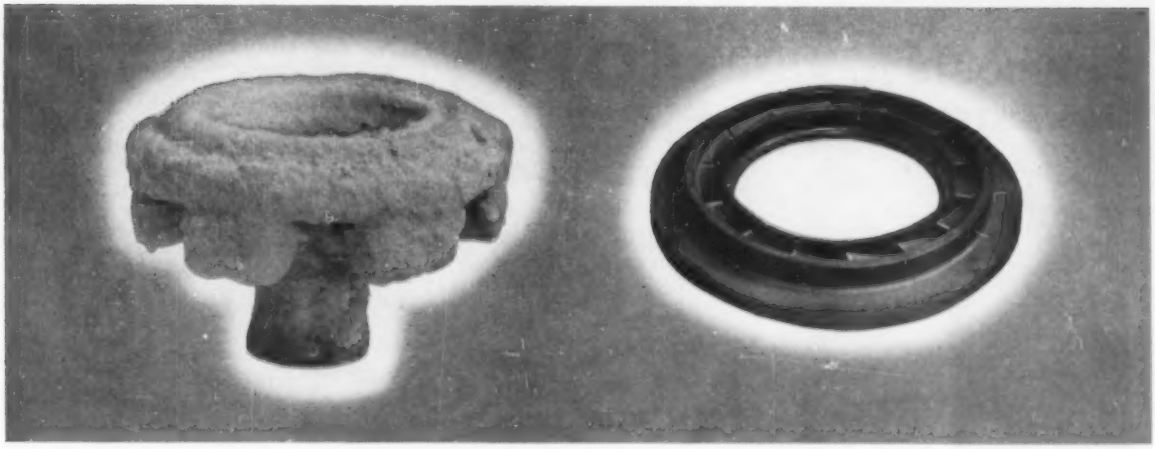
TUNGSTEN CARBIDE POWDER

UNION CARBIDE METALS CO. — Tungsten carbide powder, that allows cutting tool fabricators to produce cemented, sintered or cast inserts with a minimum of processing has been developed. The new powder meets existing standards for powders produced by conventional methods in particle size and chemical specifications.

Circle No. 245 on Reader Service Card

A SHELL OF A GOOD CASTING

New method of producing Precision Investment Castings



Ferro-Shell

UNTIL NOW IT WAS JUST A GOOD IDEA — A monolithic shell which would incorporate the basic principles of investment castings, but replace the bulky investment flask with a thin shell coating so that any size casting could be produced with greater speed and less material.

FERRO-SHELL, Ferro Cast's new monolithic shell process provides these advantages:

- **LESS TIME**—Processing time from wax pattern to casting is cut to 14½ hours.
- **REDUCES WEIGHT**—A 5 lb. shell replaces an 85 lb. investment filled steel flask.
- **SAVINGS**—Less material and less time mean lower cost.
- **DIMENSIONAL SHRINKAGE**—The same dimensional shrinkage as investment casting makes the Ferro-Shell compatible with existing molds.
- **NO CRACKING OR HOT TEARING**—As the metal solidifies the shell yields and crumbles.
- **NO SIZE LIMITATION**—Based on castings already produced, there appears to be *no limit* to size of the castings that can be produced.

LICENSES for the FERRO-SHELL PROCESS are being granted to other casting foundries. For complete information contact Ferro-Cast.

FOR TECHNICAL DATA on the Ferro-Shell process, write for the new "Ferro-Shell" brochure or visit Ferro-Cast and see it in actual production.

DIVISION OF
J. B. REA CO., INC.

FERRO CAST
2202 BROADWAY
SANTA MONICA, CALIF. • EXbrook 3-3768

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THE PIERCE-WALLER

AIR-LUBE SYSTEM

CUTS COSTS for DIE-CASTERS

• CLEANS
• LUBRICATES

Remove loose flash and clean the mold with a powerful, clean air blast — then lubricate all mold surfaces evenly, *using the same gun* —with a flick of the thumb! Adjustment *at the gun* for full range from zero to a heavy mist, spraying, fogging, or vaporizing the lubricant. Speeds up mold operation and reduces casting rejects. Makes every machine cycle count.

USED IN LARGE AND SMALL SHOPS EVERYWHERE!

WRITE FOR *FREE* FOLDER

PIERCE-WALLER, INC.
P.O. Box 2121A • DAYTON 29, OHIO

Plant: RAJAK MFG. CO.
Specialists in polyester impregnation of metals
245 N. Fourth St. • Tipp City, Ohio

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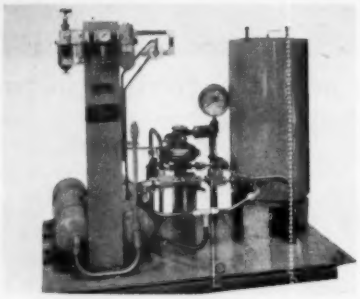
NEW PRODUCTS *continued*

ISOSTATIC TESTING CHAMBER



LOOMIS ENGINEERING & MFG. CO. —Isostatic testing chamber for compacting ceramics, ceremets and powdered metals to high density. Chamber has 10″ I.D. x 18″ deep with 15,000 psi. working pressure. The unit is provided with complete pumping system and valving ready for operation.

Circle No. 246 on Reader Service Card

SMALL CONVEYOR

HANSON-VAN WINKLE-MUNNING CO.— The Fleximatic, is a small versatile conveyor designed for the plating industry. The conveyor can do anything a full size conveyor can do. Features include: Dial-A-Cycle, which allows the operator to pick which treatment tanks a given carrier will enter; vertical oscillation; automatic load-unload.

Circle No. 247 on Reader Service Card

AUTOMATIC PARTS HANDLING

USI ROBODYNE DIV., U.S. INDUSTRIES, INC. — TransfeRobot is a automatic machine operator and assembler. The unit is a mechanical version of an arm and a many fingered hand and will perform many parts handling tasks. Its electronic "brain" can be taught to perform tasks in any desired sequence.

Circle No. 248 on Reader Service Card

4-WAY VALVE

HYDRAULIC PRESS MFG. CO. — The H-P-M ¾″ 4-way valve, 3000 psi-20 GPM, for pilot operated solenoid controlled applications, features oil-immersed solenoids. It is completely interchangeable with industry standards. Life expectancy is 20 to 30 times that of valves equipped with air-gap solenoids.

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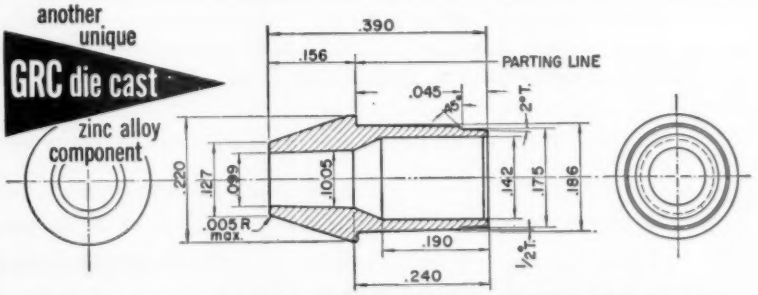
another unique GRC die cast zinc alloy component



GRC CUTS TINY BUSHING COST TO $2.00/M

Die cast by GRC in zinc alloy in a single automatic operation, this former screw machine part for a ball point pen, now costs little more than $2.00 per thousand in lots of a million. Each bushing is uniform, clean and accurate—no cut-off marks, no burrs, no secondary trimming and no scrap loss. Typical of the production economies and wide design latitude which GRC's exclusive patented methods have made possible on parts "no bigger than your thumbnail." (Maximum size is 1¾" long, ½ oz.; no size too small).

Simple or complex, let GRC's unique techniques go to work for you . . . on tiny die cast *and plastic molded* parts made to order . . . on their wide variety of standard parts available in stock—die cast wing and round head thumb nuts and screws, cap nuts, molded nylon screws, gears and pinions—you'll be glad you did.

Write, wire, phone TODAY for bulletins, spec sheets and prices. Send prints or specs for quotation.

GRIES

GRIES REPRODUCER CORP.
World's Foremost Producer of Small Die Castings
157 Beechwood Ave., New Rochelle, N. Y. • NEw Rochelle 3-8600

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IT'S LIGHTER THAN YOU THINK!

WHEN DIE CAST with ZAMAK®

These tiny zinc die cast electrical contact socket cups have a minimum wall thickness of .005"— **the thinnest wall section ever die cast.** Designed by Omaton Division of BURNDY CORPORATION, they more than meet Government specifications and are adaptable for many types of solderless multi-contact connectors.

It takes 10,371 of the smallest cups to weigh a pound and they are 20% lighter than the ones formerly made from drawn steel. Each is precision die cast to a remarkable degree of uniformity and accuracy, despite the complex design.

Such extremely thin-wall sections—possible only with zinc die castings—**frequently eliminate competition from all other materials and production methods.** In addition, ZAMAK zinc die castings provide many more advantages —and all at lower cost.

HORSE HEAD® SPECIAL ZINC AND HORSE HEAD ZAMAK ARE PRODUCED BY

THE NEW JERSEY ZINC COMPANY

DEVELOPERS OF THE ONLY STANDARD ZINC DIE CASTING ALLOYS IN USE TODAY

160 Front Street · New York 38, N. Y.

HORSE HEAD PRODUCTS®

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MERRIMAN

"KNOW-HOW" can solve your Powdered Metal Problems

and cut your costs!

The highly experienced Merriman design and engineering staffs are always available for consultation on any problem. Our skilled craftsmen transform their designs into highest quality parts which are dimensionally perfect in every respect.

WRITE FOR CATALOG AND TECHNICAL BULLETIN.

POWDERED METAL DIVISION
MERRIMAN BROS., INC.
ORIGINATORS OF SINTERED HELICAL GEARS
185 Amory Street, Boston 30, Mass.
REPRESENTATIVES IN PRINCIPAL CITIES
183 So. Chatsworth—301 St. Paul, Minn. 793 Lauriston Rd. Rochester 9, N.Y.
26018 West Seven Mile Rd. Detroit 19, Mich.

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NEW PRODUCTS *continued*

ULTRASONIC MACHINING

PRECISION GLASS PRODUCTS CO. — The company has announced a new economical service for the ultrasonic grinding and machining of hard and brittle materials on a production basis: hardened tool steel, ferrite, carbides, glass, etc. The method of machining is non-thermal, non-electrical and non-chemical. Operations performed include: drilling — blind, through or tapered as small as 0.006" dia.; multiple drilling of holes in one operation of a different diameter.

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LOW-CARBON FERROCHROME

UNION CARBIDE METALS CO. — Simplex ferrochrome, a fast dissolving ferrochrome for stainless steel, has been developed by the company. It has the lowest carbon content commercially available in a ferrochrome. In a typical test 6000 lbs. of the new alloy (3% chromium) dissolved in a 70-ton heat in less than 10 minutes.

Circle No. 251 on Reader Service Card

VACUUM PUMPS

NRC EQUIPMENT CORP. — A series of compact oil-diffusion pumps has been developed that feature high pumping speeds and minimum backstreaming. The series includes a purifying diffusion pump with 20/50 percent greater capacity than existing models; and a 300 cfm mechanical booster pump that combines a Roots type positive displacement blower and rotary gas ballast oil sealed unit. It has high pumping speed over a pressure range of 1 mm to 0.5 micron Hg.

Circle No. 252 on Reader Service Card

TUNGSTEN CRUCIBLES

KULITE TUNGSTEN CO. — Tungsten and molybdenum crucibles have been designed for high temperature research where a high melting point metallic container is required — in high vacuum, inert or reducing atmospheres. These crucibles, available in a variety of sizes, are useful in studying high temperature physical properties and viscosity measurements.

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NEW PISTON RING CATALOG BY AUTO-DIESEL

A must for all Die Casting Machine Users:

Highlighting this new catalog are:

- Dieloy Cast Iron plunger rings for Hot Chamber Machines
- Hardened Stainless Steel plunger rings
- "NIHARD STEEL RINGS" for Hot Chamber Machines
- NIHARD STEEL PLUNGER RINGS for tips on Cold Chamber Machines
- Tips & shot well sleeves are also manufactured for the die casting machines

Catalog on Request

THE AUTO-DIESEL PISTON RING CO.
3141 Superior Avenue • Cleveland 14, Ohio

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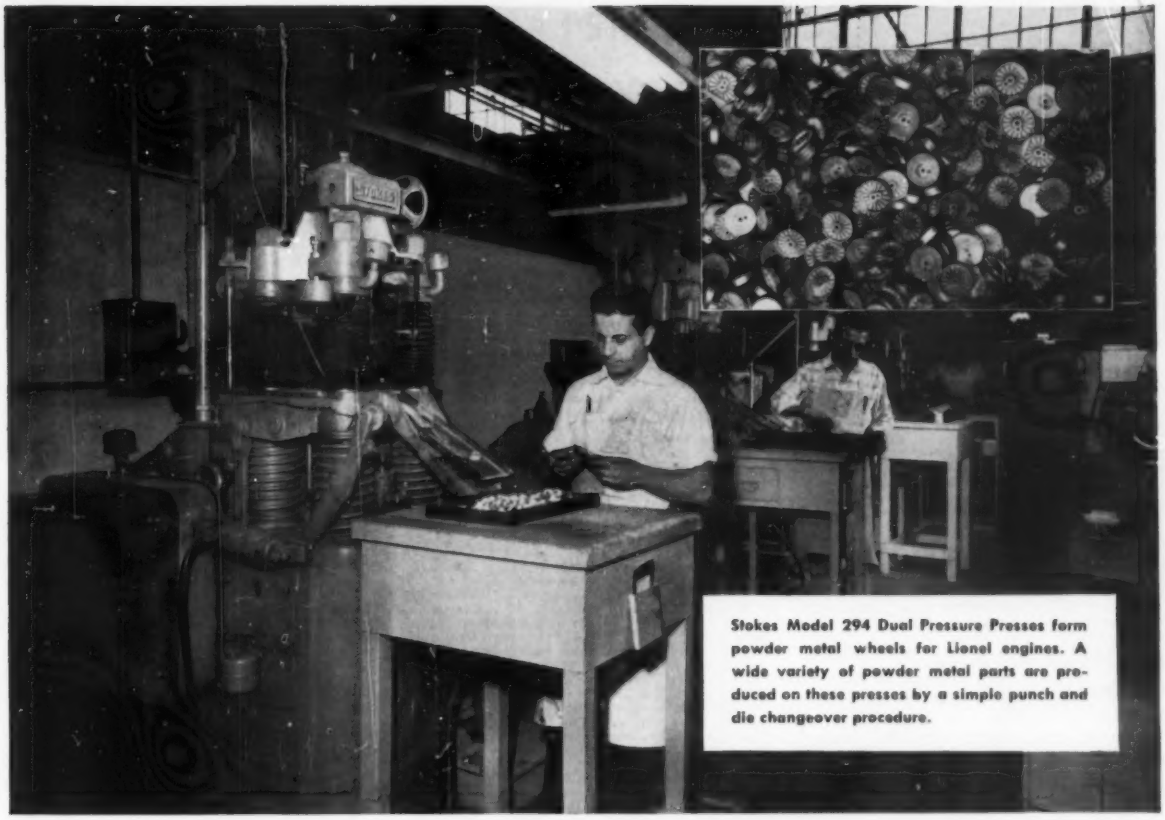

Stokes Model 294 Dual Pressure Presses form powder metal wheels for Lionel engines. A wide variety of powder metal parts are produced on these presses by a simple punch and die changeover procedure.

Stokes precision presses help Lionel model trains run on powder metal wheels

The name Lionel is synonymous with enjoyment to boys of every age. Since 1900, Lionel has manufactured hundreds of thousands of model train sets. In an effort to increase quality and reverse rising cost trends, Lionel purchased a battery of Stokes Powder Metal Presses several years ago to form many of the trains' parts. Today, over ½ million parts are produced each day on Stokes precision presses.

For example, Stokes presses form iron car wheels from powder metal. Unlike machine punched wheels, powder metal wheels are heavier. They lower the train's center of gravity and give it added stability. Finished wheels are more uniform and realistic. What's more, powder metallurgy has reduced wheel costs over 40%.

Perhaps powder metallurgy can cut your costs and save metal over conventional machining methods. It can aid you in getting properties of metals, alloys and mixtures unobtainable through other methods. And Stokes can help you determine production costs . . . handle complete laboratory production for sampling . . . include design and fabrication of punches and dies . . . and recommend types of equipment. Why not look into it further. Give Stokes a call . . . today.

Tabletting Division
F. J. STOKES CORPORATION
5500 Tabor Road, Philadelphia 20, Pa.

STOKES

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PRECISION METAL MOLDING
1959 INDEX OF ARTICLES

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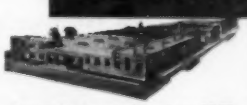

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Does Vacuum Casting Really Pay?

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The heating elements are generally of the Calrod type with stainless steel sheaths. The oxide coating always present on stainless steel makes bonding between the aluminum and the heating element difficult. A poor bond can result in air pockets and subsequent heating element failure. It also can cause poor heat transfer, so that a non-uniform temperature distribution is created across the sole plate.

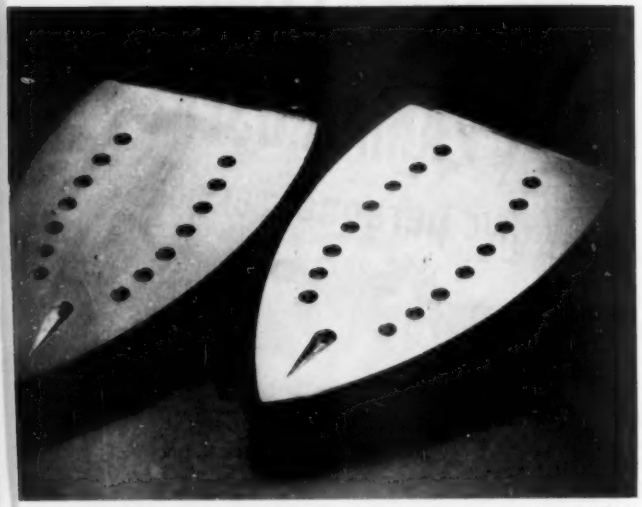

FIGURE 1. Blistering is overcome in vacuum casting (right).

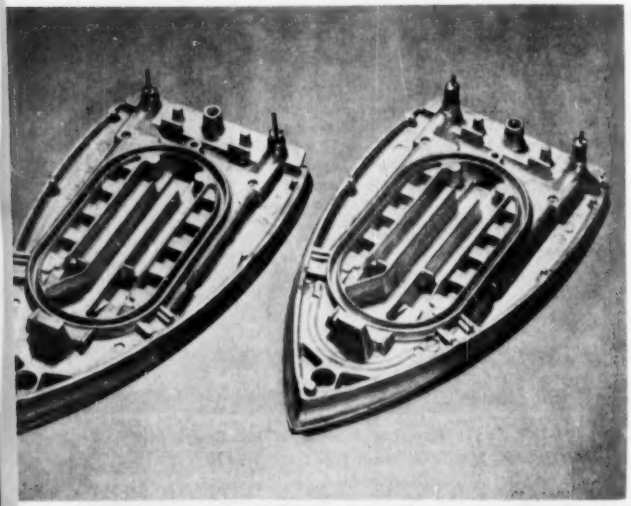

FIGURE 2. Casting detail is unchanged in vacuum casting (right).

When sole plates with cast-in heating elements are made in conventional die casting machines, operating at atmospheric pressure in the die cavity, other troubles can arise. The natural porosity of the die cast sole plate, plus the relatively thin chilled skin, usually causes from 4% to 5% rejects when the sole plate is heated to 550°F, a common test temperature. This porosity is evident by the formation of bubbles on the surface of the sole plate shown in Figure 1.

One solution to the troubles of poor bonding and blistering has been found by Premier Die Casting Co. This company, one of the larger casters of sole plates for many makes of electric irons, has installed equipment for evacuating the die cavity before and during metal injection. The improvement in blistering tests also is shown in Figure 1. This sole plate is identical to the other, except that reduced die cavity pressures were used during casting. Rejects on the vacuum cast plates are under 1%.

Microscopic examination of the two castings shows that the chilled skin formed is from two to three times as thick in the vacuum cast part. In addition, the use of reduced cavity pressures gives up to 10% increase in weight, indicative of a denser casting.

HOW ABOUT CASTING DETAIL?

Some users report better casting detail with reduced cavity pressures. Premier has not found this to be true. Figure 2 compares a vacuum cast and non-vacuum cast sole plate. In this application, at least, there is no evidence of improved die filling or detail reproduction.

Another claim made for vacuum die casting is increased cycling speed. For sole plates, this has not been true. Casting rates are about the same, regardless of the method used.

Die costs, when a new die is built, are about the same for both methods of casting. The small amount of extra machine work involved in providing an exhaust passage are about offset by the elimination of vents and the fewer overflows required. However, if an existing die is to be modified for vacuum work, the cost of change-over is from $500 to $600.

On other jobs, Premier has found that the use of reduced die cavity pressures may or may not be a benefit. Certainly, on castings where porosity is a problem, vacuum die casting is a help. Where very thin wall castings are required, again vacuum die casting may be a benefit.

In other words, vacuum die casting is another tool for the foundry. Where it is properly used, the customer will benefit through lower rejects, sounder castings, more flexible design, and ultimately lower costs. But where it is misapplied, it will only result in higher cost castings.

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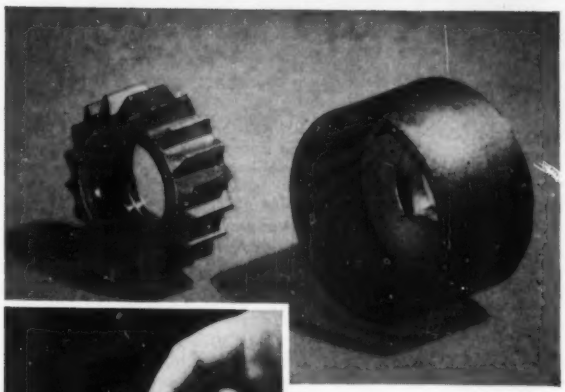

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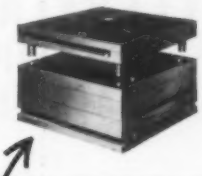

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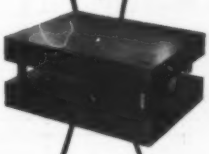

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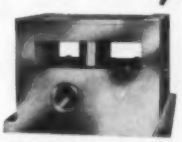

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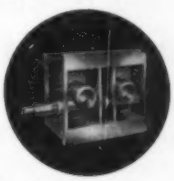

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These two men have joined the sales engineering staff of THE BUNTING BRASS AND BRONZE CO.: Joseph E. Mila, formerly with New Departure Div., General Motors Corp., will cover the Detroit territory; Lewis F. Osborne, formerly with Cincinnati Milling and Grinding Machines, Inc., will cover southwestern Ohio and Indiana.

Synclinal Sump Type
Capacities: 5—8—10—20—30—50—75 and 100 G.P.M.
Pipe Sizes: ¾"—1"—1¼"—1½"—2"—2½" and 3".
Connections: Coupling—Male Nipple.
By-pass Valve: Not Available.

Synclinal Line Type
Capacities: 5—8—10—20—30—50—75 and 100 G.P.M.
Pipe Sizes: ¾"—1"—1¼"—1½"—2"—2½" and 3".
By-pass Valve: Not available.
Operating Pressures: Up to 80 p.s.i.

Bonded Line Type
Capacities: 10—20—30—50 and 75 G.P.M.
Pipe Sizes: 1"—1¼"—1½"—2" and 2½".
By-pass Valve: Available with or without.
Operating Pressure: Up to 250 p.s.i.
Operating Temperatures: Up to 300° F.

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Capacities: 10—16—20—40—60—100—150 and 200 G.P.M.
Pipe Sizes: ¾"—1"—1¼"—1½"—2"—2½" and 3".
Connections: Coupling—Male Nipple.
By-pass Valve: Not available.

Bonded Sump Type
Capacities: 10—20—30—50 and 75 G.P.M.
Pipe Sizes: 1"—1¼"—1½"—2" and 2½".
Connections: Coupling—"O" Ring—Male Nipple.
By-pass Valve: Available with or without.

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☐ Water ☐ Sump Type ☐ Line Type ☐ In-Line

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DATA OFFERED IN THIS MONTH'S ADS

Qualified readers may obtain any of these free reference materials by circling the numbers on the Reader Service Cards

2. **Furnaces** — from half-a-ton capacity to ten tons for melting ferrous and non-ferrous metals are described in technical literature from Ajax Electrothermic Div., Ajax-Magnethermic Corp.

3. **Tool Steels** — Publication list from Allegheny Ludlum Steel Corp. describes 125 technical publications on tool steels which are available.

5. **Die Casting Machines** — Data on Model 150 Z. Features include 150 tons locking pressure and a 4 lb. shot capacity. American Die Casting Machinery Co.

8. **Investment Casting** — "Practical Guide to Investment Casting" is a 44-page design handbook from Arwood Precision Casting Corp.

9. **Piston Ring** — Catalog from Auto-Diesel Piston Ring Co. lists plunger rings, tips and shot well sleeves for all die casting machine users.

10. **Trim Presses** — B & T Machinery Co. offers to show why its hydraulic die casting trim presses are exceedingly fast and efficient.

11. **Sintering** — The "Engineering Handbook of Powder Metallurgy" and Catalog No. 58, which lists 2,227 sizes of completely finished cast bronze sintered oil-filled bearings, are available from Bunting Brass & Bronze Co.

12. **Investment Cast 17-4PH** — Cannon-Muskegon Corp. offers the ICI technical research report on the effect of aging time and temperature on the mechanical properties of investment cast 17-4PH.

13. **Die Casting Machines** — Complete line of Cast-Master die casting machines is described in Catalog CM-100 from H-P-M Div., Koehring Co.

14. **Induction Melting** — Bulletin R 58 from Ajax Engineering Div., Ajax-Magnethermic Corp. describes the Ajax-Junker, a 60 cycle induction furnace for many different applications, melting ferrous and non-ferrous metals.

18. **Standardized Die Components** — which reduce design time and cut die construction costs, are described in a 170-page catalog. The Detroit Mold Engineering Corp.

19. **Investment Casting With Shell Molds** — Technical data on Ferro-Shell, a new monolithic shell process from Ferro Cast, Div. J. B. Rea Co.

22. **Small Zinc Die Castings** — Bulletins, specification sheets, and prices are available from Gries Reproducer Corp. on their small zinc die castings that are produced in one automatic operation.

23. **Zinc Die Casting Facts** — Henning Bros. & Smith, Inc. has issued an engineering data book on "Die Casting with Zinc Base Alloys".

24. **Ovens** — Technical bulletin No. 159 from Hevi-Duty Electric Co. gives complete details on continuous and batch type ovens for core-baking and heat treating.

25. **Investment Castings** — Brochure from Hitchiner Mfg. Co., gives technical data on utilizing the freedom and savings offered with investment casting.

28. **Air or Vacuum Melting** — Bulletin 20-30 from Inductotherm Corp. describes the Inducto Integral 30, an efficient and economical melting unit for a variety of applications.

30. **Compacting Press** — Specifications and data on the Fawcett 3000 ton Special Purpose Hydraulic Metal-Powder Compacting Press. International Sales Management Co.

31. **Die Casting Machines** — Catalog illustrates the features and models of the full line of Kux Machine Co. die casting machines.

33. **Extrusion Die Steel** — Technical literature on die steel for every extrusion tool application is available from Latrobe Steel Co.

34. **Induction Heating Units** — from Lepel High Frequency Laboratories, Inc., for brazing, melting, annealing, etc. are presented in an engineering catalog.

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AMERICAN CANCER SOCIETY

36. Sinterings — Powdered metal parts problems? A technical bulletin from Merriman Bros., Inc. shows how Merriman "know-how" solves powdered metal problems and cuts your costs.

37. Fluxes — Improved fluxes for zinc, and aluminum are described in technical literature from Milles Equipment & Supply Co.

39. Investment Castings — The bimonthly magazine, "Casting About With Misco", is available from Misco Precision Casting Co.

43. Cutting Costs — with brass powder metallurgy. Engineering data booklet evaluates this production method in terms of particular needs. The New Jersey Zinc Co.

47. Cleans, Lubricates — That's what the Air-Lube System, manufactured by Pierce-Waller, Inc. Does. Technical data sheets are available.

48. Sintering Savings — A technical report, "How to Cut Costs With The Remet Powdered Metal Process" is available from Reese Metal Products Corp.

49. High Strength Alloy Powder — Technical data on HS6460 a high strength alloy powder that permits production of higher strength parts at less cost on your present equipment. Republic Steel Corp.

52. Ladles — Technical data and prices are available from Spincraft, Inc. on their line of stainless steel ladles.

54. Statistical Quality Control — for die castings. Technical literature from Stroh Die Casting Co., Inc. describes their use of quality control for lower inspection costs.

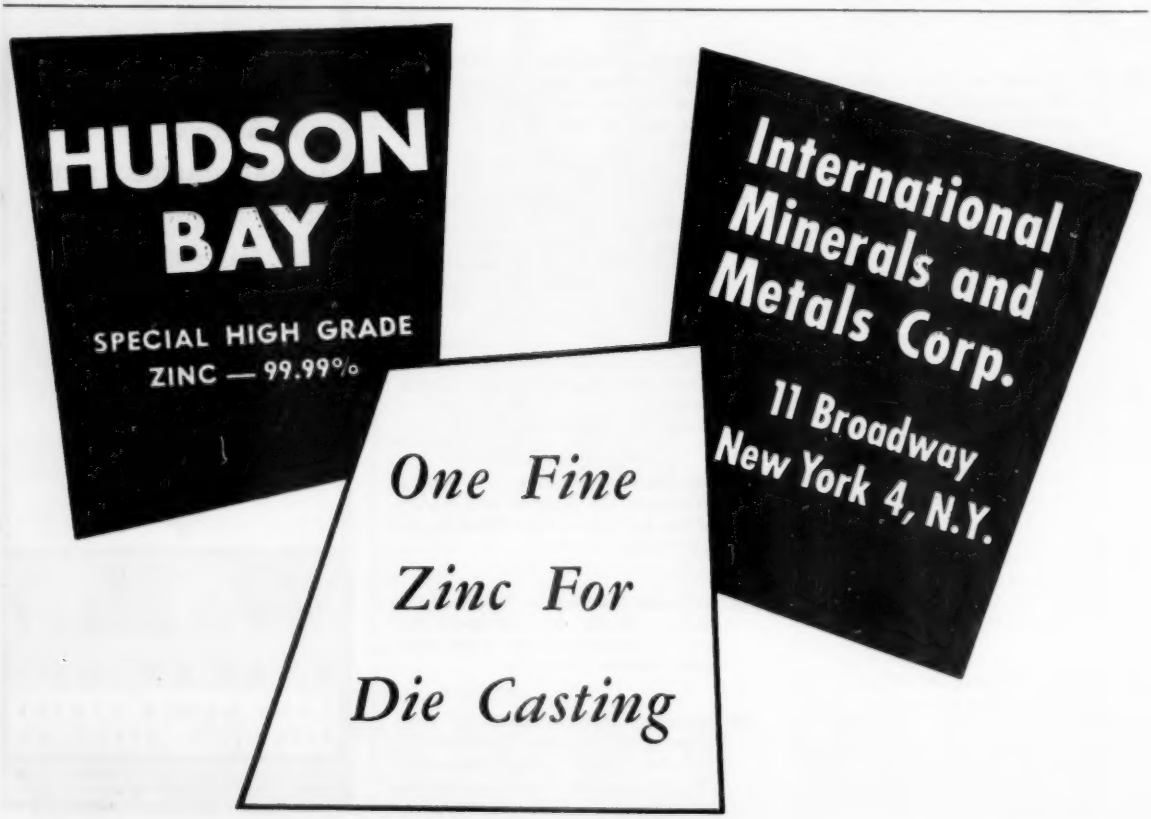
56. Temperature Control — Bulletin COM from West Instrument Corp. discusses better temperature control and what it means to you.

57. Finishing Data File — on process chemicals for the metal finishing industry. Allied Research Products, Incorporated.

59. Coatings — for chemically polishing, deburring and protecting zinc and aluminum die castings are described in technical literature from Heatbath Corp.

65. Die Casting Machines — Specifications on the complete line of Lester die casting machines for either aluminum or zinc. Lester-Phoenix, Incorporated.

68. Die Casting Machines — 12-page catalog from A.B.C. Die Casting Machine Co. gives complete specifications on a line of air operated and hydraulic operated die casting machines in capacities from 16 tons to 600 tons.



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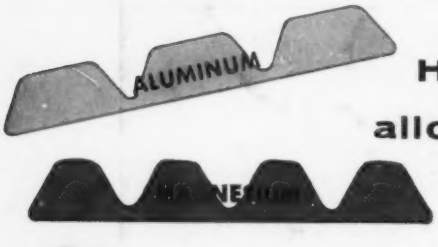

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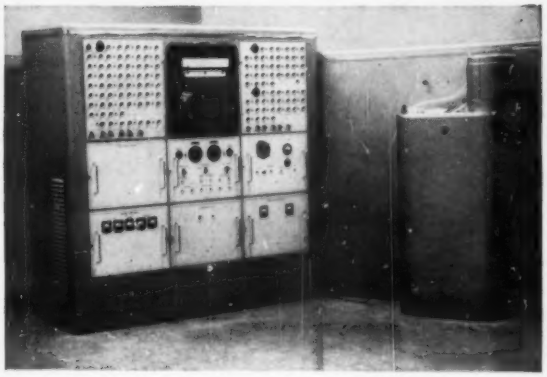

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